TECHNICAL MANUAL

FOR

RADIO RECEIVING SETS

AN/WRR-2A & 2B AND AN/FRR-59A & 59B

PUBLISHED BY DIRECTION OF

COMMANDER, NAVAL SEA SYSTEMS COMMAND

T-4
NAVSHIPS 0967-137-3014 UNCLASSIFIED February 1967

TEMPORARY CHANGE T-4 to TECHNICAL MANUAL for RADIO RECEIVING SET AN/WRR-2A, AN/FRR-59A, NAVSHIPS 0967-137-3010 (Formerly NAVSHIPS 94715).

This temporary change contains information originally published as separate articles (Technical Manual Corrections) in the Electronics Information Bulletin, (EIB), number: 14S, 661.

The instructions, described herein, for making these changes shall be followed only if they have not been previously accomplished at the time the EIB, in which the information appeared, was received.

The purpose of this Temporary Change is to assure that publications drawn from stock, subsequent to publication of this information in the EIB, can be corrected.

Insert this Temporary Change in the technical manual immediately behind the front cover and preceding the title page or preceding the latest change or correction in effect.

Make pen-and-ink corrections or changes to the technical manual as follows:

Change Table 5-14, page 5-80, step 8, second column, to read: ". . . . . . J707: 10 vac, or more, measured on Band 4."

NAVSHIPS 0967-137-3013
T-3 to NAVSHIPS 94715

22 September 1965

TEMPORARY CHANGE T3 TO TECHNICAL MANUAL FOR RADIO RECEIVING SETS AN/WRR-2A & 2B and AN/FRR-59A & 59B
NAVSHIPS 94715

1. This temporary correction is in effect for AN/WRR-2B and AN/FRR-59B serial numbers A-1 and above supplied under NObsr 91231.

2. The purpose of this temporary correction is to include in the Technical Manual the production change made to improve the frequency response of the audio low pass filters FL1801 and FL1802. This change has been factory installed in AN/WRR-2B and AN/FRR-59B serial numbers A-1 and above.

3. The revised title page and list of effective pages, pages i & ii, shall be inserted in place of the original title page and list of effective pages, pages i & ii. The supplementary parts list, new page 7-0A, shall be inserted immediately preceding page 7-1.

4. Make the following pen and ink corrections. Insert this temporary correction in the Technical Manual immediately behind the front cover and preceding temporary correction T2.

PAGE	ENTRY	ACTION
4-27	Figure 4-30	Change C1039 from ".015" to ".015 for AN/WRR-2A and AN/FRR-59A equipments, .044 for AN/WRR-2B and AN/FRR-59B equipment".
4-30	Figure 4-35	Change C1140 from ".015" to ".015 for AN/WRR-2A and AN/FRR-59A equipments, .044 for AN/WRR-2B and AN/FRR-59B equipments".
5-67	Figure 5-48	Change "C1037, .015" to C1039, .015 for AN/WRR-2A and AN/FRR-59A equipments, .044 for AN/WRR-2B and AN/FRR-59B equipments".
5-101	Figure 5-71	Change C1140 from ".015" to ".015 for AN/WRR-2A and AN/FRR-59A equipments, .044 for AN/WRR-2B and AN/FRR-59B equipments".
5-109	Figure 5-77	Insert above FL1801 "R1677 thru R1680 apply to AN/WRR-2B and AN/FRR-59B equipments". Add "R1677, 150" from FL1801-1 to FL1801-3. Add "R1678, 150" from FL1801-3 to FL1801-2. Add "R1679, 150" from FL1802-1 to FL1802-3. Add "R1680, 150" from FL1802-3 to FL1802-2.
5-59/ 6-60	Figure 6-18	Insert above FL1801, location F7. "R1677 thru R1680 apply to AN/WRR-2B and AN/FRR-59B equipments". Add "R1677, 150" from FL1801-1 to FL1801-3. Location F7. Add "R1679, 150" from FL1802-1 to FL1801-2. Location G7. Add "R1679, 150" from FL1802-1 to FL1802-3. Location G7. Add "R1680, 150" from FL1802-3 to FL1802-2. Location H7.

PAGE	ENTRY	ACTION
6-63/6-64	Figure 6-19	Change C1039 from ".015" to ".015 for AN/WRR-2A and AN/FRR-59A equipments, .044 for AN/WRR-2B and AN/FRR-59B equipments". Change C1140 from ".015" to ".015 for AN/WRR-2A and AN/FRR-59A equipments, .044 for AN/WRR-2B and AN/FRR-59B equipments".

NAVSHIPS 94715

(Non Registered)

TECHNICAL MANUAL

for

RADIO RECEIVING SETS
AN/WRR-2A & 2B
and AN/FRR-59A & 59B

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

Approved by BuShips: 17 March 1964

LIST OF EFFECTIVE PAGES

PAGE NUMBER	CHANGE IN EFFECT
Title Page & ii	T - 3
iii thru xi	Original
1 - 1 thru 1-4	Original
2-1 thru 2-16	Original
3-1 thru 3-13	Original
4-1 thru 4-48	Original
5-1 thru 5-118	Original
6-1 thru 6-70	Original
7-0A	T - 3
7-1 thru 7-65	Original
i-0 thru 1-2	Original

NATIONAL CO., INC. MALDEN, MASSACHUSETTS	CONTRACT: NObsr 91085
ARVIN INDUSTRIES, INC. COLUMBUS, INDIANA	CONTRACT: NObsr 91231

Errors found in this publication (other than obvious typographical errors) which have not been corrected by means of Temporary Changes or Permanent Changes should be reported. Such report should include the complete title of the publication and the publication number (short title), identify the page and line or figure and location of the error, and be forwarded to the Publications Section of the Bureau of Ships.

All requests for this publication should be directed to the Naval Supply Depot, 5801 Tabor Avenue, Philadelphia 20, Pennsylvania.

SECTION 7A

TABLE 7-0A RADIO RECEIVING SETS AN/WRR-2B AND AN/FRR-59B

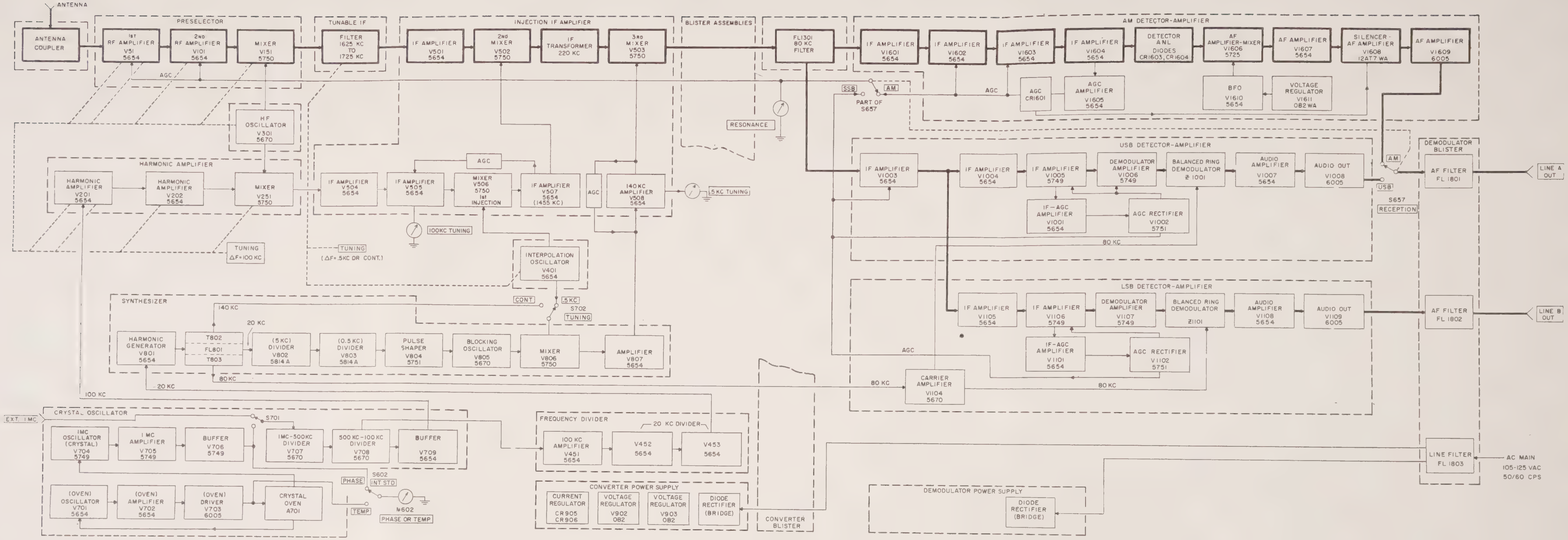
SUPPLEMENTARY PARTS LIST

Applies to equipment supplied on contract NObsr 91231 only.

REF. DISIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C714		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ± 20%; type no. CK70AW102M, 00656 type.	CR701 Feedthru by-pass Figure 5-55
C731		Same as C714	S702 Feedthru by-pass Figure 5-55
C745		Same as C714	V709 Screen Supply Feedthru By-pass Figure 5-55
C1039		CAPACITOR, FIXED, PAPER DIELECTRIC: 400 vdc working 0.044 uf. ± 5%; 00656 dwg/part no. P323ZNP400V443P.	V1008 Figure 5-49
C1140		Same As C1039	V1109 Figure 5-72
R1677		RESISTOR, FIXED COMPOSITION: 150 ohms ± 5% 1/2 W; type no. RC20GF151J.	J651 Demodulator Blister AF 5 KC Figure 5-78
R1678		Same as R1677	J651 Demodulator Blister AF 5 KC Figure 5-78
R1679		Same as R1677	J651 Demodulator Blister AF 5 KC Figure 5-78
R1680		Same as R1677	J651 Demodulator Blister AF 5 KC Figure 5-7B

Page	Entry	Action
1-1 ✓	Paragraph 1-4a(9)	Delete "(9) CENTER OF GRAVITY: (See figure 2-1)".
2-13	Running Head	Change "Paragraph 2-4b(6)" to "Paragraph 2-5b(6)".
2-14	Running Head	Change "Paragraph 2-4d(2)(b)" to "Paragraph 2-5d(2)(c)".
2-14	Paragraph 2-5d(2)(d)	After "LINE A OUTPUT meter.", add: "Adjust the output of the signal generator for MINIMUM or ZERO."
2-15	Running Head	Change "Paragraph 2-4e(7)(e)" to "Paragraph 2-5e(7)(e)".
3-1 ✓	Paragraph 3-2a, lines 3, 4, and 5	Add period (.) after "receiver" in line 3. Delete "except the .5 KC/CONT. TUNING control which is located behind the filter cover on the converter drawer", in lines 3, 4, and 5.
4-3/ 4-4	Figure 4-3	Add note to figure 4-3: "OBSOLETE-SUPERSEDED BY FIGURE T2-1".
4-9 ✓	Figure 4-6	Change value of F2801 from "25 Amp" to ".25 Amp".
4-9	Figure 4-7	At wiper arm of R607B, add junction, 1/2-inch line, and arrow. Label arrow: "TO IF AMPS".
4-10	Figure 4-9	Add "KILOCYCLE" before "TUNING CONTROL".
4-14	Paragraph 4-6e, column 2, line 5	Change "IM" to "IF".
4-15	Figure 4-15	Change "TO 1KC TUNING METER" to "TO .5KC TUNING METER".
4-16	Figure 4-17	Add junction to output from "AGC RECTIFIER CR1601 CR1602". Connect junction to "SILENCER V1608B 12AT7WA" and add arrow to indicate signal flow (from agc to silencer).

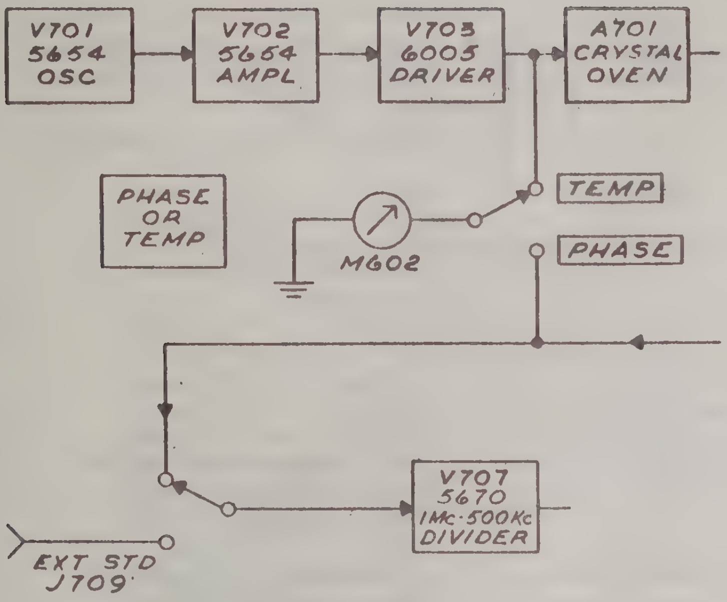
Page	Entry	Action
4-17	Figure 4-19	Add junction where line from R1622 to C1616 crosses line from R1623 to ground.
4-18	Figure 4-20	Add position for "FAST" on S1605.
4-20	Figure 4-22	Change "Part OF R1665 (OPENS CCW)" to "PART OF R1664 (OPENS CCW)".
4-21	Paragraph 4-8f, column 2, line 4	Change "viltage" to "voltage".
4-23	Paragraph 4-8g, column 1, line 7	Change "resister" to "resistor"
4-32	Figure 4-37	Correct figure 4-37 as shown in figure T2-2.
5-80	Table 5-14, step 8, NORMAL INDICATION column	After "J707": delete "25 to 30 vac"; replace with "10 vac or more on Band 4 only".
6-47/ 6-48	Figure 6-15	Correct figure 6-15 as shown in figure T2-3.
7-10	C207 Description	Delete "300 vdc working 1600 mmf. ±2%; MIL-C-5B type No. CM30E302G, 72136 type". Replace with "500 vdc working 1600 mmf. ±2%; 42498 type A39096-2".
7-13	C253 Description	Delete "300 vdc working 1600 mmf. ±2%; MIL-C-5B type No. CM30E302G, 72136 type". Replace with "500 vdc working 1600 mmf. ±2%; 42498 type A39096-2".
7-46	C1023 Description	Delete "MIL-C-5B type No. CM15C150J, 72136 type". Replace with "42498 type A39096-1".
7-51	C1124 Description	Delete "MIL-C-5B type No. CM15C150J, 72136 type". Replace with "42498 type A39096-1".


ANTENNA
ANTENNA COUPLER
PRESELECTOR
1st RF AMPLIFIER V51 5654
2ND RF AMPLIFIER V101 5654
MIXER V151 5750
AGC
TUNABLE IF
FILTER 1625 KC TO 1725 KC
INJECTION IF AMPLIFIER
IF AMPLIFIER V501 5654
2ND MIXER V502 5750
IF TRANSFORMER 220 KC
3RD MIXER V503 5750
BLISTER ASSEMBLIES
RESONANCE
FL1301 80 KC FILTER
AM DETECTOR-AMPLIFIER
IF AMPLIFIER V1601 5654
IF AMPLIFIER V1602 5654
IF AMPLIFIER V1603 5654
IF AMPLIFIER V1604 5654
DETECTOR ANL DIODES CR1603, CR1604
AF AMPLIFIER-MIXER V1606 5725
AF AMPLIFIER V1607 5654
SILENCER - AF AMPLIFIER V1608 12AT7 WA
AF AMPLIFIER V1609 6005
SSB
AM
PART OF S657
AGC
AGC CR1601
AGC AMPLIFIER V1605 5654
BFO V1610 5654
VOLTAGE REGULATOR V1611 0B2 WA
HF OSCILLATOR V301 5670
HARMONIC AMPLIFIER
HARMONIC AMPLIFIER V201 5654
HARMONIC AMPLIFIER V202 5654
MIXER V251 5750
TUNING ΔF=100 KC
IF AMPLIFIER V504 5654
IF AMPLIFIER V505 5654
AGC
MIXER V506 5750 1st INJECTION
IF AMPLIFIER V507 5654 (1455 KC)
AGC
140 KC AMPLIFIER V508 5654
.5 KC TUNING
100KC TUNING
TUNING
(ΔF=.5KC OR CONT.)
INTERPOLATION OSCILLATOR V401 5654
USB DETECTOR-AMPLIFIER
IF AMPLIFIER V1003 5654
IF AMPLIFIER V1004 5654
IF AMPLIFIER V1005 5749
DEMODULATOR AMPLIFIER V1006 5749
BALANCED RING DEMODULATOR Z 1001
AUDIO AMPLIFIER V1007 5654
AUDIO OUT V1008 6005
IF-AGC AMPLIFIER V1001 5654
AGC RECTIFIER V1002 5751
80 KC
AM
USB
S657
RECEPTION
DEMODULATOR BLISTER
AF FILTER FL 1801
LINE A OUT
SYNTHESIZER
140 KC
20 KC
CONT
.5 KC
S702
TUNING
HARMONIC GENERATOR V801 5654
T802
FL801
T803
(5 KC) DIVIDER V802 5814 A
(0.5 KC) DIVIDER V803 5814 A
PULSE SHAPER V804 5751
BLOCKING OSCILLATOR V805 5670
MIXER V806 5750
AMPLIFIER V807 5654
80 KC
20 KC
100 KC
LSB DETECTOR-AMPLIFIER
IF AMPLIFIER V1105 5654
IF AMPLIFIER V1106 5749
DEMODULATOR AMPLIFIER V1107 5749
BLANCED RING DEMODULATOR Z1101
AUDIO AMPLIFIER V1108 5654
AUDIO OUT V1109 6005
IF-AGC AMPLIFIER V1101 5654
AGC RECTIFIER V1102 5751
AGC
80 KC
CARRIER AMPLIFIER V1104 5670
80 KC
AF FILTER FL 1802
LINE B OUT
EXT. 1MC
CRYSTAL OSCILLATOR
S701
1MC OSCILLATOR (CRYSTAL) V704 5749
1 MC AMPLIFIER V705 5749
BUFFER V706 5749
1MC-500KC DIVIDER V707 5670
500 KC-100 KC DIVIDER V708 5670
BUFFER V709 5654
(OVEN) OSCILLATOR V701 5654
(OVEN) AMPLIFIER V702 5654
(OVEN) DRIVER V703 6005
CRYSTAL OVEN A701
PHASE
S602
INT STD
TEMP
M602
PHASE OR TEMP
FREQUENCY DIVIDER
20 KC DIVIDER
100 KC AMPLIFIER V451 5654
V452 5654
V453 5654
CONVERTER POWER SUPPLY
CURRENT REGULATOR CR905 CR906
VOLTAGE REGULATOR V902 0B2
VOLTAGE REGULATOR V903 0B2
DIODE RECTIFIER (BRIDGE)
CONVERTER BLISTER
DEMODULATOR POWER SUPPLY
DIODE RECTIFIER (BRIDGE)
LINE FILTER FL 1803
AC MAIN
105-125 VAC
50/60 CPS

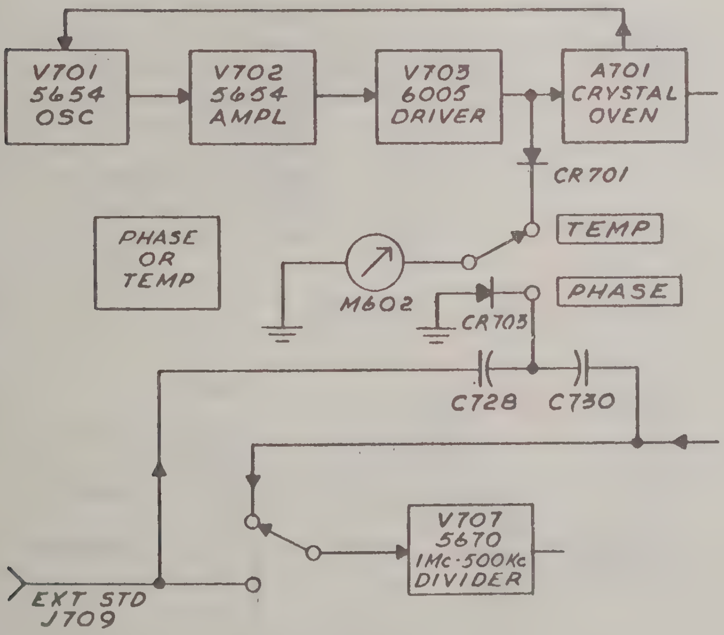
NOTE

THIS DIAGRAM SUPERCEDES AND REPLACES FIGURE 4-3, PP4-3/4-4 OF NAVSHIPS 94715

Figure T2-1. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Detailed Block Diagram

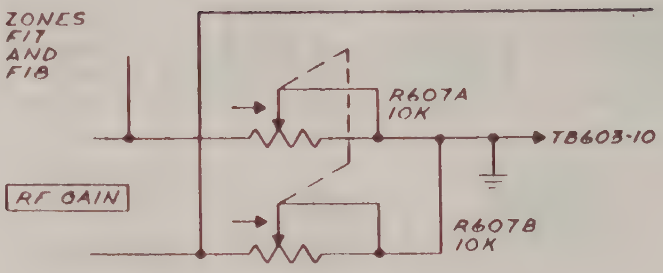

V701
5654
OSC
V702
5654
AMPL
V703
6005
DRIVER
A701
CRYSTAL
OVEN
PHASE
OR
TEMP
TEMP
M602
PHASE
V707
5670
1Mc-500Kc
DIVIDER
EXT STD
J709

INCORRECT

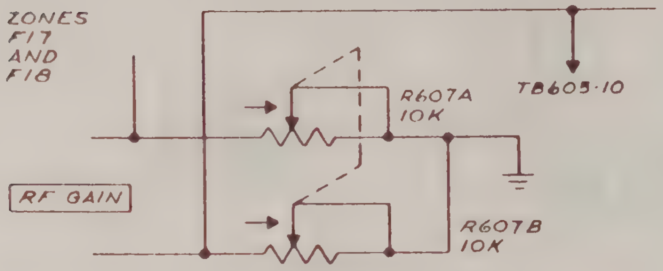

V701
5654
OSC
V702
5654
AMPL
V703
6005
DRIVER
A701
CRYSTAL
OVEN
CR701
PHASE
OR
TEMP
TEMP
M602
PHASE
CR703
C728
C730
V707
5670
1Mc-500Kc
DIVIDER
EXT STD
J709

CORRECT

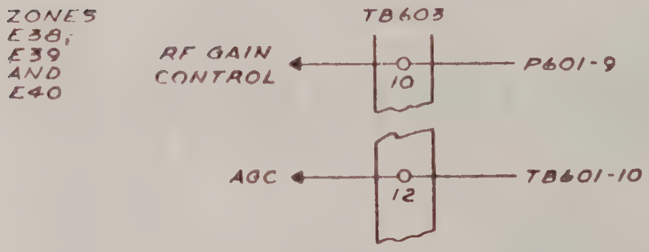
Figure T2-2. Corrections to figure 4-37, page 4-32


ZONES
F17
AND
F18
R607A
10K
TB603-10
RF GAIN
R607B
10K

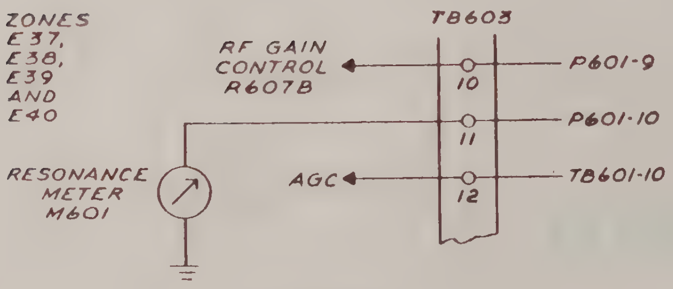
INCORRECT


ZONES
F17
AND
F18
TB603-10
R607A
10K
RF GAIN
R607B
10K

CORRECT


ZONES
E38,
E39
AND
E40
TB603
RF GAIN
CONTROL
10
P601-9
AGC
12
TB601-10

INCORRECT


ZONES
E37,
E38,
E39
AND
E40
TB603
RF GAIN
CONTROL
R607B
10
P601-9
11
P601-10
RESONANCE
METER
M601
AGC
12
TB601-10

CORRECT

Figure T2-3. Corrections to figure 6-15, pp 6-47/6-48

0967-137-30

TEMPORARY CORRECTION T1 TO TECHNICAL MANUAL FOR RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A
NAVSHIPS 94715

1. This temporary correction is in effect for all serial numbers of AN/WRR-2A; and AN/FRR-59A.

2. The purpose of this temporary correction is to include in the Technical Manual the production change made to improve the operation of blocking oscillator V805 in the Synthesizer assembly for low primary power voltage, and to compensate for production variations in blocking transformer T801. This change has been factory installed in AN/WRR-2A serial number A-40 and above, and in AN/FRR-59A serial number A-70 and above.

3. Wherever possible the corrections given in these pages should be copied directly into the Technical Manual.

4. Temporary corrections shall be inserted in the manual immediately behind the front cover, preceding any previous changes.

Page	Entry	Action
4-41	Figure 4-48	Change C822 from ".01" to "1200" Change C824 from "3-13" to "7-45" Change R836 from "220" to "1 K" Change R837 from "330 K" to "2.2 MEG"
5-91	Figure 5-63	Change C822 from ".01" to "1200" Change C824 from "3-13" to "7-45" Change R836 from "220" to "1 K" Change R837 from "330 K" to "2.2 MEG"
6-53/ 6-54	Table 6-7, V805, Pin No. 7	Change "-3" to "-6.8" Change "330k" to "2.2m"
6-55/ 6-56	Figure 6-17 Grids J, K, 26, 27, 28	Change C822 from ".01" to "1200" Change C824 from "3-13" to "7-45" Change R836 from "220" to "1 K" Change R837 from "330 K" to "2.2 MEG"
7-36	C822 Description	Delete "same as C814" Insert "Capacitor, Fixed, Mica Dielectric: 300 vdc working, 0.0012 μf. ±5%; type no. CM20C122J, 72136 type."
	C824 Description	Change "3-13 μμf." to "7-45 μμf." Change "CV11B130" to "CV11D450"
7-40	R836 Description	Change "220 ohms" to "1000 ohms" Change RC20GF221J" to "RC20GF102J"
	R837 Description	Change "330,000 ohms" to "2.2 megohms" Change RC20GF334J" to "RC20GF225J"

0967-137-3010

NAVSHIPS 94715

FORMERLY 0280-810-3000
(Non Registered)

TECHNICAL MANUAL
for
RADIO RECEIVING SETS
AN/WRR-2A
and AN/FRR-59A

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS

Approved by BuShips: 17 March 1964

BASIC W/TC-1 dtd JULY 1964
TC-2 dtd AUGUST 1965
TC-3 dtd AUGUST 1965
TC-4 dtd FEBRUARY 1967

LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Original	4-0 to 4-48	Original
ii to xi	Original	5-1 to 5-118	Original
1-0 to 1-4	Original	6-1 to 6-70	Original
2-1 to 2-16	Original	7-1 to 7-65	Original
3-1 to 3-13	Original	i–0 to i–2	Original

NATIONAL CO., INC. MALDEN, MASSACHUSETTS CONTRACT: NObsr 91085

Errors found in this publication (other than obvious typographical errors) which have not been corrected by means of Temporary Changes or Permanent Changes should be reported. Such report should include the complete title of the publication and the publication number (short title), identify the page and line or figure and location of the error, and be forwarded to the Publications Section of the Bureau of Ships.

All requests for this publication should be directed to the Naval Supply Depot, 5801 Tabor Avenue, Philadelphia 20, Pennsylvania.

TABLE OF CONTENTS

SECTION 1—GENERAL INFORMATION

Paragraph *Page*
1-1. Introduction 1-1
1-2. Functional Description 1-1
1-3. Factory or Field Changes 1-1
1-4. Quick Reference Data 1-1
1-5. Equipment Lists 1-2
  a. Equipment Supplied 1-2
  b. Equipment Required but Not Supplied 1-2
  c. Shipping Data 1-2
  d. Tube Complement 1-2

SECTION 2—INSTALLATION

2-1. Unpacking and Handling 2-1
2-2. Power Requirements and Distribution 2-1
2-3. Installation Layout 2-2
2-4. Installation Requirements 2-2
2-5. Inspection and Adjustments 2-13
  a. General 2-13
  b. Initial Energizing of Equipment 2-13
  c. Tuning Performance 2-14
  d. Reception Modes 2-14
  e. Operation of Special Circuits 2-15
2-6. Preparation for Reshipment 2-16
  a. Equipment Disassembly 2-16
  b. Repackaging 2-16

SECTION 3—OPERATOR'S SECTION

3-1. Functional Operation 3-1
3-2. Operating Procedures 3-1
  a. Description of Controls 3-1
  b. Sequence of Operation 3-1
    (1) Starting 3-1
    (2) Tuning 3-5
    (3) Amplitude-Modulated Operation 3-5
    (4) Single-Sideband Operation 3-5
    (5) Other Operating Adjustments. 3-5
  c. Indicator Presentations 3-6
  d. Nonoperating Controls 3-7
3-3. Summary of Operation 3-7

SECTION 3—OPERATOR'S SECTION (Cont.)

Paragraph *Page*
  a. Partial Failure 3-7
  b. Operation in the Presence of Jamming 3-9
3-4. Operator's Maintenance 3-10
  a. General 3-10
  b. Operating Checks and Adjustments 3-10
  c. Routine Check Charts 3-11
  d. Emergency Maintenance 3-11

SECTION 4—PRINCIPLES OF OPERATION

4-1. Over-All Functional Description 4-0
  a. General 4-0
  b. System Block Diagram 4-0
  c. Functional Operation 4-0
  d. Detailed Block Diagram 4-2
  e. Triple Frequency Conversion 4-2
  f. Incremental Tuning 4-2
  g. Continuous Tuning 4-6
  h. Frequency-Drift Cancellation 4-6
4-2. Functional Sections 4-6
4-3. Antenna Coupler 4-6
4-4. Preselector 4-6
4-5. Tunable IF Filter 4-6
4-6. Injection IF Amplifier 4-11
4-7. 80 Kc Filter 4-14
4-8. Amplitude Modulation (AM) Detector-Amplifier 4-15
4-9. Upper-Sideband Detector-Amplifier 4-23
4-10. LSB Detector-Amplifier 4-26
4-11. Crystal Oscillator 4-30
4-12. Harmonic Amplifier and Mixer 4-33
4-13. High-Frequency Oscillator V301 4-35
4-14. Interpolation Oscillator V401 4-37
4-15. Frequency Divider 4-37
4-16. Synthesizer 4-37
4-17. Converter Power Supply 4-42
4-18. Demodulator Power Supply 4-43
4-19. Blisters 4-43
4-20. Drift-Canceling Loops 4-43

TABLE OF CONTENTS (Cont.)

SECTION 5—TROUBLE-SHOOTING

Paragraph *Page*

5-1. General 5-1
5-2. Test Equipment and Special Tools... 5-2
5-3. Over-All Trouble-Shooting 5-3
5-4. Functional Trouble-Shooting........ 5-3
5-5. Primary Power Section 5-5
5-6. Converter Power Supply 5-6
5-7. Demodulator Power Supply 5-11
5-8. Antenna Coupler 5-13
5-9. Preselector 5-15
5-10. Tunable IF Filter 5-17
5-11. Injection IF Amplifier 5-21
5-12. 80 Kc Filter 5-24
5-13. AM Detector-Amplifier 5-27
5-14. High-Frequency Oscillator 5-48
5-15. Harmonic Amplifier 5-52
5-16. Interpolation Oscillator 5-57
5-17. USB Detector-Amplifier 5-60
5-18. Crystal Oscillator 5-66
5-19. Frequency Divider 5-81
5-20. Synthesizer 5-84
5-21. LSB Detector-Amplifier 5-92
5-22. Converter Blister 5-96
5-23. Demodulator Blister 5-101
5-24. Typical Troubles 5-108

SECTION 6—REPAIR

6-1. Failure Report 6-1
6-2. Tuning and Adjustment 6-1
  a. General 6-1
  b. Adjustments 6-1
  c. Prerequisites 6-1
  d. Test Equipment and Special Tools. 6-1
  e. Preliminary Control Settings 6-1
6-3. Converter 6-1
  a. Crystal Oscillator.............. 6-2
  b. Frequency Divider 6-3
  c. Synthesizer 6-4

SECTION 6—REPAIR (Cont.)

Paragraph *Page*

  d. Interpolation Oscillator 6-5
  e. Injection IF Amplifier 6-6
  f. HF Oscillator 6-7
  g. Harmonic Amplifier 6-8
  h. Preselector 6-8
  i. Tunable IF Filter 6-9
6-4. Demodulator 6-10
  a. 80 Kc IF Filter 6-10
  b. 80 Kc Variable IF 6-11
  c. BFO 6-11
  d. Gain Bal. (Gain Balance) Adjustments 6-12
  e. USB Gain Bal. Adjustment....... 6-12
  f. LSB Gain Bal. Adjustment........ 6-12
  g. AM Gain Bal. Adjustment 6-12
6-5. Removal, Adjustment, Repair and Reassembly of Parts and Subassemblies 6-12
  a. General 6-12
  b. Converter Maintenance 6-12
    (1) Antenna Coupling 6-12
    (2) Preselector Maintenance 6-14
    (3) Tunable IF Filter Maintenance 6-18
    (4) Injection IF Amplifier Maintenance 6-18
    (5) High-Frequency Oscillator Maintenance 6-19
    (6) Harmonic Amplifier Maintenance 6-20
    (7) Interpolation Oscillator Maintenance 6-22
    (8) Crystal Oscillator Maintenance. 6-23
    (9) Frequency Divider Maintenance 6-26
    (10) Synthesizer Maintenance 6-27
    (11) Converter Unit Power Supply Maintenance 6-27
    (12) Converter Blister Maintenance. 6-28
    (13) Alignment and Ganging of Capacitors 6-30
  c. Demodulator Unit Maintenance... 6-31
    (1) 80 Kc IF Filter 6-31
    (2) AM Detector-Amplifier 6-33
    (3) USB Detector-Amplifier 6-34
    (4) LSB Detector-Amplifier 6-36
    (5) Demodulator Power Supply .. 6-37
    (6) Demodulator Blister 6-38

TABLE OF CONTENTS (Cont.)

SECTION 6—REPAIR (Cont.)

Paragraph *Page*

d. Maintenance of Auxiliary Parts.... 6-38
- (1) General 6-38
- (2) Internal Standard Adjustment Control and Int. Std. Log Counter 6-38
- (3) Ventilating Axial Fan 6-39
- (4) Air Filter 6-39

e. Lubrication 6-39
- (1) General 6-39
- (2) Lubrication of Components... 6-39

f. Dial Lamps 6-40

6-6. Schematic Diagrams 6-41

SECTION 7—PARTS LIST

7-1. Introduction 7-1

7-2. List of Manufacturers 7-1
- *a.* Numerical 7-1
- *b.* Alphabetical 7-1

7-3. Maintenance Parts List 7-1

7-4. Explanatory Notes 7-1

LIST OF ILLUSTRATIONS

SECTION 1—GENERAL INFORMATION

Figure *Page*

1-1. Radio Receiving Sets, General View . . 1-0

SECTION 2—INSTALLATION

2-1. Radio Receiving Set AN/WRR-2A, Outline Drawing 2-3

2-2. Radio Receiving Set AN/FRR-59A, Outline Drawing 2-4

2-3. Drawer — Operating Mechanism 2-5

2-4. Deck — Operating Mechanism 2-6

2-5. Cabinet Mounting Details 2-7

2-6. External Cable Connections 2-8

2-7. Mounting MT-2293A/WRR-2 Assy Details 2-9

2-8. Antenna Input Connector Assembly . . 2-11

2-9. Power and Audio Connector Assembly 2-12

SECTION 3—OPERATOR'S SECTION

3-1. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Front View 3-2

3-2. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Tuning Counter Presentations 3-6

SECTION 4—PRINCIPLES OF OPERATION

4-1. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Basic Block Diagram 4-0

4-2. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Functional Block Diagram 4-1

4-3. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Detailed Block Diagram 4-3

4-4. Radio Receiving Sets AN/WRR-2A, and AN/FRR-59A, Frequency Conversion Diagram 4-5

4-5. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Basic Tuning Diagram 4-7

4-6. Antenna Coupler, Simplified Schematic Diagram 4-9

SECTION 4—PRINCIPLES OF OPERATION (Cont.)

Figure *Page*

4-7. Preselector RF Amplifiers, Simplified Schematic Diagram 4-9

4-8. Preselector Mixer, Simplified Schematic Diagram 4-10

4-9. Tunable IF Filter, Simplified Schematic Diagram 4-10

4-10. Injection IF Amplifier, Block Diagram 4-11

4-11. Basic Frequency-Drift-Canceling Loop, Block Diagram 4-12

4-12. IF Amplifier V501 and Mixers V502 and V503, Simplified Schematic Diagram 4-12

4-13. IF Amplifiers V504 and V505, Simplified Schematic Diagram 4-13

4-14. Mixer V506 and IF Amplifier V507, Simplified Schematic Diagram 4-14

4-15. 140 Kc Amplifier, Simplified Schematic Diagram 4-15

4-16. 80 Kc Filter, Simplified Schematic Diagram 4-15

4-17. AM Detector-Amplifier, Block Diagram 4-16

4-18. IF Amplifier V1601, Simplified Schematic Diagram 4-16

4-19. IF Amplifiers V1602, V1603, and V1604, Simplified Schematic Diagram 4-17

4-20. Automatic Gain Control Circuits of AM Detector-Amplifier, Simplified Schematic Diagram 4-18

4-21. Detector CR1603 and Automatic Noise Limiter CR1604, Simplified Schematic Diagram 4-19

4-22. Silencer V1608B and AF Amplifier V1607, Simplified Schematic Diagram 4-20

4-23. Output-Limiter Circuit CR1605 and CR1606, Simplified Schematic Diagram 4-21

4-24. AF Amplifiers V1608A and V1609, Simplified Schematic Diagram 4-22

4-25. Beat-Frequency Oscillator V1610, Simplified Schematic Diagram 4-22

4-26. Upper-Sideband Detector-Amplifier, Block Diagram 4-23

LIST OF ILLUSTRATIONS (Cont.)

SECTION 4—PRINCIPLES OF OPERATION (Cont.)

Figure *Page*

4-27. IF Amplifiers V1003, V1004, and V1005, Simplified Schematic Diagram 4-24

4-28. Automatic Gain Control Circuits, Simplified Schematic Diagram..... 4-25

4-29. Demodulator Amplifier V1006 and Balanced-Ring Demodulator Z1001, Simplified Schematic Diagram 4-26

4-30. Audio Amplifiers V1007 and V1008, Simplified Schematic Diagram 4-27

4-31. LSB Detector-Amplifier, Block Diagram 4-28

4-32. IF Amplifiers V1105 and V1106, Simplified Schematic Diagram..... 4-29

4-33. Carrier Amplifier V1104, Simplified Schematic Diagram 4-29

4-34. Demodulator Amplifier V1107 and Balanced-Ring Demodulator Z1101, Simplified Schematic Diagram..... 4-30

4-35. Audio Amplifier V1108 and V1109, Simplified Schematic Diagram..... 4-30

4-36. USB and LSB AGC Interconnections Simplified Schematic Diagram..... 4-31

4-37. Crystal Oscillator, Block Diagram.... 4-32

4-38. Oven Oscillator-Amplifier, Simplified Schematic Diagram 4-33

4-39. Crystal Oscillator-Amplifier, Simplified Schematic Diagram..... 4-34

4-40. Frequency Dividers V707 and V708 and Buffer V709, Simplified Schematic Diagram 4-35

4-41. Harmonic Amplifier and Mixer, Simplified Schematic Diagram 4-36

4-42. High-Frequency Oscillator, Simplified Schematic Diagram 4-38

4-43. Interpolation Oscillator, Simplified Schematic Diagram 4-38

4-44. Frequency Divider, Simplified Schematic Diagram 4-39

4-45. Synthesizer, Block Diagram 4-39

4-46. Harmonic Generator V801, Simplified Schematic Diagram 4-40

SECTION 4—PRINCIPLES OF OPERATION (Cont.)

Figure *Page*

4-47. Dividers V802 and V803, Simplified Schematic Diagram 4-40

4-48. Pulse Shaper V804 and Blocking Oscillator V805, Simplified Schematic Diagram 4-41

4-49. Amplifier-Mixer V806 and Amplifier V807, Simplified Schematic Diagram 4-42

4-50. Converter Power Supply, Simplified Schematic Diagram 4-43

4-51. Demodulator Power Supply, Simplified Schematic Diagram 4-44

4-52. Converter-Demodulator Interconnections 4-45

4-53. Receiver Drift Cancellation, Block Diagram 4-46

4-54. High-Frequency Oscillator Drift Cancellation, Block Diagram 4-47

4-55. Interpolation Oscillator Drift Cancellation, Block Diagram 4-47

SECTION 5—TROUBLE-SHOOTING

5-1. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Power-Distribution Diagram 5-4

5-2. Converter Power Supply, Functional Schematic Diagram 5-7

5-3. Converter Power Supply, Location of Parts 5-8

5-4. Converter Power Supply, Location of Test Points 5-11

5-5. Demodulator Power Supply, Functional Schematic Diagram 5-12

5-6. Demodulator Power Supply, Location of Parts 5-13

5-7. Demodulator Power Supply, Location of Test Points.................. 5-13

5-8. Antenna Coupler, Functional Schematic Diagram 5-16

5-9. Antenna Coupler, Location of Parts.. 5-17

5-10. Antenna Coupler, Location of Test Points 5-17

LIST OF ILLUSTRATIONS (Cont.)

SECTION 5—TROUBLE-SHOOTING (Cont.)

Figure *Page*

5-11. Preselector, Functional Schematic Diagram 5-19

5-12. Preselector, Location of Parts........ 5-22

5-13. Preselector, Location of Test Points.. 5-25

5-14. Tunable IF Filter, Functional Schematic Diagram 5-26

5-15. Tunable IF Filter, Location of Parts.. 5-27

5-16. Tunable IF Filter, Location of Test Points 5-27

5-17. Injection IF Amplifier, Functional Block Diagram 5-29

5-18. Injection IF Amplifier, 1625 Kc to 1725 Kc and 220 Kc IF Amplifiers, Functional Schematic Diagram 5-31

5-19. Injection IF Amplifier, 825 Kc Injection Amplifier, Functional Schematic Diagram 5-32

5-20. Injection IF Amplifier, 1405 Kc to 1505 Kc Injection Amplifier, Functional Schematic Diagram 5-33

5-21. Injection IF Amplifier, 140 Kc Injection Amplifier, Functional Schematic Diagram 5-33

5-22. Injection IF Amplifier, Location of Parts 5-34

5-23. Injection IF Amplifier, Location of Test Points 5-36

5-24. 80 Kc Filter, Functional Schematic Diagram 5-38

5-25. 80 Kc Filter, Location of Parts and Test Points 5-38

5-26. AM Detector-Amplifier, Functional Block Diagram 5-39

5-27. AM Detector-Amplifier, AGC Amplifier, Functional Schematic Diagram 5-39

5-28. AM Detector-Amplifier, 80 Kc IF Amplifier, Functional Schematic Diagram 5-40

5-29. AM Detector-Amplifier, RF Bandpass Selector, Functional Schematic Diagram 5-41

SECTION 5—TROUBLE-SHOOTING (Cont.)

Figure *Page*

5-30. AM Detector-Amplifier, Detector, Automatic Noise Limiter, Audio Silencer, and Audio Amplifier, Functional Schematic Diagram 5-42

5-31. AM Detector-Amplifier, BFO, Functional Schematic Diagram 5-43

5-32. AM Detector-Amplifier, Output Limiter and Audio Amplifier, Functional Schematic Diagram 5-44

5-33. AM Detector-Amplifier, Location of Parts 5-45

5-34. AM Detector-Amplifier, Location of Test Points 5-47

5-35. High-Frequency Oscillator, Functional Schematic Diagram 5-51

5-36. High-Frequency Oscillator, Location of Parts 5-51

5-37. High-Frequency Oscillator, Location of Test Points 5-52

5-38. Harmonic Amplifier, Functional Schematic Diagram 5-54

5-39. Harmonic Amplifier, Location of Parts 5-55

5-40. Harmonic Amplifier, Location of Test Points 5-59

5-41. Interpolation Oscillator, Functional Schematic Diagram 5-60

5-42. Interpolation Oscillator, Location of Parts 5-62

5-43. Interpolation Oscillator, Location of Test Points 5-63

5-44. USB Detector-Amplifier, Functional Block Diagram.................. 5-63

5-45. USB Detector-Amplifier, 78 Kc IF Amplifier, Functional Schematic Diagram 5-64

5-46. USB Detector-Amplifier, AGC Amplifier, Functional Schematic Diagram 5-65

5-47. USB Detector-Amplifier, Demodulator, Functional Schematic Diagram 5-66

5-48. USB Detector-Amplifier, Audio Amplifier, Functional Schematic Diagram 5-67

LIST OF ILLUSTRATIONS (Cont.)

SECTION 5—TROUBLE-SHOOTING (Cont.)

Figure *Page*

5-49. USB Detector-Amplifier, Location of Parts 5-68

5-50. USB Detector-Amplifier, Location of Test Points 5-69

5-51. Crystal Oscillator, Functional Block Diagram 5-70

5-52. Crystal Oscillator, Oven Oscillator-Amplifier, Functional Schematic Diagram 5-73

5-53. Crystal Oscillator, Crystal Oscillator-Amplifier, Functional Schematic Diagram 5-74

5-54. Crystal Oscillator, Frequency Divider, Functional Schematic Diagram 5-75

5-55. Crystal Oscillator, Location of Parts.. 5-76

5-56. Crystal Oscillator, Location of Test Points 5-82

5-57. Frequency Divider, Functional Schematic Diagram 5-85

5-58. Frequency Divider, Location of Parts 5-86

5-59. Frequency Divider, Location of Test Points 5-88

5-60. Synthesizer, Functional Block Diagram 5-89

5-61. Synthesizer, Harmonic Generator, Functional Schematic Diagram 5-89

5-62. Synthesizer, Frequency Divider, Functional Schematic Diagram 5-90

5-63. Synthesizer, Pulse Shaper and Blocking Oscillator, Functional Schematic Diagram 5-91

5-64. Synthesizer, Injection Mixer—Amplifier (140 Kc), Functional Schematic Diagram 5-92

5-65. Synthesizer, Location of Parts 5-93

5-66. Synthesizer, Location of Test Points.. 5-97

5-67. LSB Detector-Amplifier, Functional Block Diagram 5-98

5-68. LSB Detector-Amplifier, 82 Kc Amplifier, Functional Schematic Diagram 5-98

SECTION 5—TROUBLE-SHOOTING (Cont.)

Figure *Page*

5-69. LSB Detector-Amplifier, AGC Amplifier and Combiner, Functional Schematic Diagram 5-99

5-70. LSB Detector-Amplifier, Demodulator and Carrier Amplifier, Functional Schematic Diagram 5-100

5-71. LSB Detector-Amplifier, Audio Amplifier, Functional Schematic Diagram 5-101

5-72. LSB Detector-Amplifier, Location of Parts 5-102

5-73. LSB Detector-Amplifier, Location of Test Points 5-104

5-74. Converter Blister, Functional Schematic Diagram 5-107

5-75. Converter Blister, Location of Parts.. 5-107

5-76. Converter Blister, Location of Test Points 5-108

5-77. Demodulator Blister, Functional Schematic Diagram 5-109

5-78. Demodulator Blister, Location of Parts 5-111

5-79. Demodulator Blister, Location of Test Points 5-114

5-80. Location of Test Points.......... 5-117

SECTION 6—REPAIR

6-1. Physical Arrangement of Capacitor C461 6-4

6-2. Converter Drawer, Lower Deck, Top View 6-13

6-3. Converter Drawer, Lower Deck, Bottom View 6-15

6-4. Converter Drawer, Upper Deck, Top View 6-24

6-5. Converter Drawer, Upper Deck, Bottom View 6-25

6-6. Converter and Demodulator Blisters.. 6-29

6-7. Converter Drawer, Main Tuning Mechanism 6-31

6-8. Demodulator Drawer, Lower Deck, Top View 6-32

LIST OF ILLUSTRATIONS (Cont.)

SECTION 6—REPAIR (Cont.)

Figure *Page*

6-9. Demodulator Drawer, Lower Deck, Bottom View 6-35

6-10. Demodulator Drawer, Upper Deck, Top View 6-36

6-11. Demodulator Drawer, Upper Deck, Bottom View 6-40

6-12. Lubrication Points, Counter Mechanism 6-41

6-13. Lubrication Points, Bandswitching Mechanism 6-42

6-14. Lubrication Points, Slide Mechanism. 6-43

6-15. Converter, Lower Deck (Antenna Coupler, Preselector, Harmonic Amplifier, High-Frequency Oscillator), Schematic Diagram ... 6-47

SECTION 6—REPAIR (Cont.)

Figure *Page*

6-16. Converter, Lower Deck (Tunable IF Filter, Interpolation Oscillator, Injection IF Amplifier, Frequency Divider), Schematic Diagram 6-51

6-17. Converter, Upper Deck, Schematic Diagram 6-55

6-18. Demodulator, Upper Deck, Schematic Diagram 6-59

6-19. Demodulator, Lower Deck, Schematic Diagram 6-63

6-20. Demodulator Power Supply, Schematic Diagram 6-65

6-21. Converter and Demodulator Blisters, Interconnections 6-66

6-22. Converter, Wiring Diagram 6-67

6-23. Demodulator, Wiring Diagram 6-69

LIST OF TABLES

SECTION 1—GENERAL INFORMATION

Table *Page*

1-1. Equipment Supplied 1-3
1-2. Equipment Required But Not Supplied 1-3
1-3. Shipping Data 1-4

SECTION 2—INSTALLATION

2-1. Connectors (Plugs) Supplied, Equipment for Making External Connections 2-10

SECTION 3—OPERATOR'S SECTION

3-1. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Front-Panel Controls 3-1
3-2. Control Settings, AM Operation..... 3-5
3-3. Control Settings, SSB Operation..... 3-6
3-4. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Summary of Operation 3-8
3-5. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Trouble-Shooting Guide 3-12

SECTION 5—TROUBLE-SHOOTING

5-1. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Reference Numbers and Subassembly Locations.... 5-1
5-2. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Preliminary Control Settings 5-2
5-3. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, System Trouble-Shooting Chart 5-3
5-4. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Primary Power Trouble-Shooting Chart 5-5
5-5. Converter Power Supply, Trouble-Shooting Chart 5-8
5-6. Demodulator Power Supply, Trouble-Shooting Chart 5-14
5-7. Preselector, Trouble-Shooting Chart . 5-18
5-8. Injection IF Amplifier Trouble-Shooting Chart 5-28
5-9. AM Detector-Amplifier, Trouble-Shooting Chart 5-48
5-10. High-Frequency Oscillator, Trouble-Shooting Chart 5-53
5-11. Harmonic Amplifier, Trouble-Shooting Chart 5-58

SECTION 5—TROUBLE-SHOOTING (Cont.)

Table *Page*

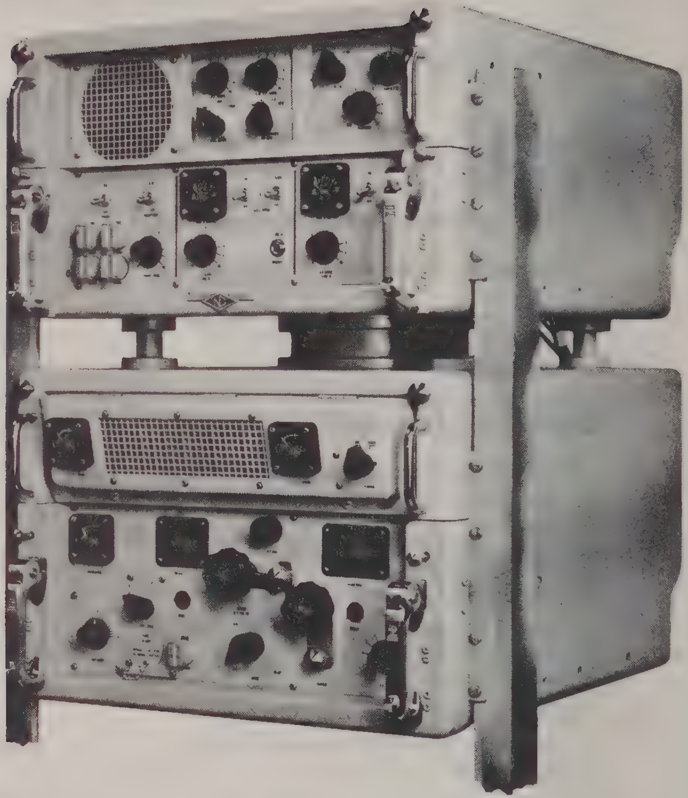
5-12. Interpolation Oscillator, Trouble-Shooting Chart 5-61
5-13. USB Detector-Amplifier, Trouble-Shooting Chart 5-70
5-14. Crystal Oscillator, Trouble-Shooting Chart 5-79
5-15. Frequency Divider, Trouble-Shooting Chart 5-87
5-16. Synthesizer, Trouble-Shooting Chart. 5-94
5-17. LSB Detector-Amplifier, Trouble-Shooting Chart 5-105
5-18. Converter Blister, Trouble-Shooting Chart 5-108
5-19. Demodulator Blister, Trouble-Shooting Chart 5-112
5-20. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Typical Troubles 5-115

SECTION 6—REPAIR

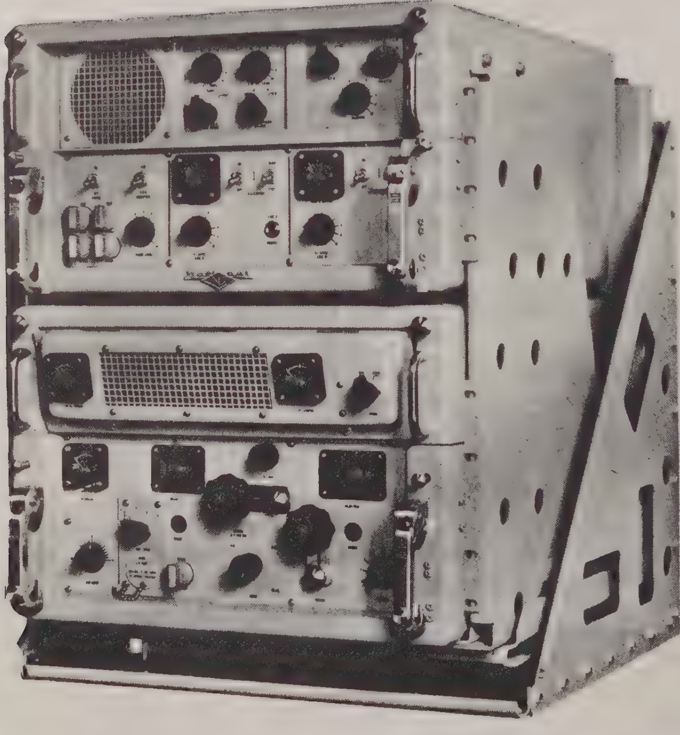
6-1. Test Equipment for Tuning and Adjustment 6-2
6-2. Preliminary Control Settings 6-3
6-3. Alignment Chart, Harmonic Amplifier and HF Oscillator 6-9
6-4. Alignment Chart, Preselector 6-10
6-5. Voltage and Resistance Measurements for Fig. 6-15 6-45
6-6. Voltage and Resistance Measurements for Fig. 6-16 6-49
6-7. Voltage and Resistance Measurements for Fig. 6-17 6-53
6-8. Voltage and Resistance Measurements for Fig. 6-18 6-57
6-9. Voltage and Resistance Measurements for Fig. 6-19 6-61

SECTION 7—PARTS LIST

7-1. List of Manufacturers in Federal Supply Code Order 7-2
7-2. List of Manufacturers, Alphabetical.. 7-3
7-3. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Maintenance Parts List 7-4



AN/FRR-59A



AN/WRR-2A

Figure 1—1. Radio Receiving Set, General View of Equipment

SECTION 1

GENERAL INFORMATION

1-1. INTRODUCTION.

A general view of Radio Receiving Sets AN/WRR-2A and AN/FRR-59A appears in figure 1-1. The AN/WRR-2A is designed for shipboard installation and is equipped with Mounting MT-2293A/WRR-2 (mounting cradle). The AN/FRR-59A is for shore operation and is designed for rack mounting. Otherwise, the two receivers are identical.

1-2. FUNCTIONAL DESCRIPTION.

The AN/WRR-2A and AN/FRR-59A are triple-conversion superheterodyne receivers designed to operate in the frequency range of 2 mc to 32 mc. They are intended for use in all classes and types of ships employed in the United States Navy in communications between ships, between ship and shore, and with aircraft.

The receiver is intended primarily for the reception of single-sideband transmissions with full carrier suppression. It will also receive conventional amplitude-modulated (AM) signals of various types, including continuous wave (CW), modulated continuous wave (MCW), voice, facsimile, and frequency-shift teletype. In order to meet present strict frequency tolerances, special features of the receiver provide extremely accurate tuning and a very high degree of stability over long periods of operation. Simultaneous use of both upper-and lower-sideband channels for receiving two different types of intelligence is possible. This capability does not extend to concurrent reception of single-sideband and AM signals.

The receiver will net with any transmitter capable of operating in the same frequency range, provided the emitted signal is one of the types mentioned above, and the receiver is compatible with existing shipboard auxiliary equipments which process facsimile and frequency-shift teletype data.

The receiver consists of Electronic Frequency Converter CV-920A/URR (converter drawer) and Intermediate Frequency-Audio Frequency Amplifier AM-2477A/URR (demodulator drawer) in individual, joined cabinets. The demodulator drawer is above the converter drawer.

Signal voltages applied at the receiver antenna are fed to the converter circuits through a special coupling device which offers protection against damage from excessively high signal voltages. In the converter drawer, the frequency range is divided into four tuning bands. A selector switch and direct-reading counters facilitate band selection and tuning. Tuning from 2 mc to 32 mc may be incremental or continuous. In the former method, a crystal-controlled internal frequency standard permits extremely accurate settings in increments of a 0.5 kilocycle; complete cancellation of oscillator frequency drift is achieved, and a frequency stability of one part in 10^7 (one cycle in 10 mc) is obtained. Continuous tuning must be used for frequencies which terminate in a fraction of a half kilocycle; this method reduces slightly the stability of the receiver.

After the process of tuning, triple frequency conversion, and intermediate-frequency (IF) amplification have been performed in the converter drawer, the resultant IF signal is passed to the upper, or demodulator, drawer, where further IF and audio frequency (AF) amplification and detection are performed. The demodulator drawer contains three detector-amplifier sections. One processes conventional AM signals and has a beat-frequency oscillator (BFO) for reception of CW, facsimile, and frequency-shift teletype signals. The other two sections detect and amplify signals in the upper- and lower-sideband channels. Each section has its own automatic gain control (AGC).

Each drawer has its own separate power supply.

1-3. FACTORY OR FIELD CHANGES.

No factory or field changes have been made.

1-4. QUICK REFERENCE DATA.

a. GENERAL.

(1) NOMENCLATURE: Radio Receiving Set AN/WRR-2A; Radio Receiving Set AN/FRR-59A

(2) CONTRACT NUMBER: NObsr 91085

(3) CONTRACTOR: National Company, Inc., Malden, Massachusetts, U.S.A.

(4) DATE OF CONTRACT: 16 December 1963.

(5) COGNIZANT NAVAL INSPECTOR: Inspector of Naval Material, 495 Summer Street, Boston 10, Mass.

(6) NUMBER OF PACKAGES: 2

(7) AMBIENT TEMPERATURE LIMITATIONS: Will operate reliably within limits of 0°C (+32°F) to +50°C (+122°F) after nonoperating exposure to temperatures from −62°C (−80°F) to +75°C (+167°F).

(8) VENTILATION: Fan cooled upper limit 112° ±5°F; lower limit 86° ±5°F; heat dissipation 14.22 BTU/min.

~~(9) CENTER OF GRAVITY: (See figure 2-1)~~

b. ELECTRICAL CHARACTERISTICS.

(1) FREQUENCY RANGE.

(*a*) Nominal: 2 mc to 32 mc, inclusive.

(*b*) Frequency Overlap: minimum 1.9 mc to 32.1 mc, inclusive.

(2) TUNING BANDS AND BAND RANGES: four bands — 2-4 mc, 4-8 mc, 8-16 mc, 16-32 mc.

(3) TYPE OF FREQUENCY CONTROL.

(a) Incremental tuning: 0.5 kc tuning increments controlled by a crystal standard.

(b) Continuous tuning: 330 100-kc increments controlled by the crystal standard; lesser increments oscillator-controlled.

(4) TYPES OF RECEPTION.

(a) A1: on/off keyed CW.

(b) A2: on/off keyed tone-modulated CW.

(c) A3: voice (amplitude) modulated CW.

(d) A9: single sideband.

(e) F1: frequency-shift teletype, high-speed data transmission, and four-channel multiplex.

(f) F4: facsimile.

(5) MAXIMUM RECEIVER OUTPUT.

(a) AF line terminals: minimum 60 mw into 600 ohm noninductive-resistive load.

(b) Phone jacks: maximum 15 mw into 600 ohm noninductive-resistive load.

(6) FREQUENCY-CONTROL CRYSTAL (INTERNAL STANDARD).

(a) Government designation: CR-36/U (special) in HC-6/U holder.

(b) Oscillation frequency: 1 mc.

(c) Crystal temperature coefficient: one part per million per degree C from +80°C (+176°F) to +90°C (+194°F).

(d) Crystal operating temperature: 85°C (185°F) ±1°C.

(e) Frequency accuracy over the operating range: ±0.0005% of the nominal frequency at 85°C (185°F) ±5 cps at 1 mc.

(7) FREQUENCY STABILITY AND ACCURACY DATA.

(a) Incremental tuning (full drift cancellation): 1 part in 10^7 per day.

(b) Continuous tuning: 1 part in 10^7 ±150 cycles per day.

(c) Environmental changes:

Change	*Frequency Variation*
Line voltage, from 103.5 vac to 126.5 vac	1 part in 10^8 (A9)
Temperature, from 0°C (32°F) to 50°C (122°F)	1 part in 10^7 ±150 cps (A1); 1 part in 10^7 (A9)
Relative humidity, from 30% to 90%	1 part in 10^7 ±100 cps (A1); 1 part in 10^7 (A9)

(8) RECEIVER SENSITIVITY. — Listed below are the minimum input voltages required to cause a desired output signal of 6 milliwatts to appear across an output load of 600 ohms at a predetermined level above that of noise:

Mode	*IF Bandwidth in kc*	*Input Voltage in uv*
A1	0.35	1.5
A1	1.0	2.5
A2	3.0	3.0
A3	12.0	6.0
A9	12.0	4.0*
F1	3.0	3.0
F4	3.0	3.0

*Applicable to each sideband AF output.

(9) ELECTRICAL CHARACTERISTICS OF RECOMMENDED ANTENNA. — For optimum performance, an antenna having a 50-ohm terminal impedance is recommended.

(10) PRIMARY POWER REQUIREMENTS.

(a) Voltage: 115 v, 50-60 cps, single-phase. Primary voltage regulation not to exceed ±10%.

(b) Current requirements: nominal, 2.17 a.

(c) Power, nominal: 250 w at 115 v, 60 cps.

(11) HETERODYNE FREQUENCY RANGE.

(a) High-frequency oscillator: 3.725 mc to 33.725 mc.

(b) Interpolation oscillator: 680 kc to 580 kc.

(12) IF FREQUENCIES DEVELOPED.

(a) First conversion: 1625 kc to 1725 kc (100 kc band).

(b) Second conversion: 220 kc.

(c) Third (final) conversion: 80 kc.

1-5. EQUIPMENT LISTS.

a. EQUIPMENT SUPPLIED. — Table 1-1 lists the names, quantities, dimensions, and weights of all equipments supplied with the receiver.

b. EQUIPMENT REQUIRED BUT NOT SUPPLIED. — Equipment required for operation of the receiver, but not supplied, is listed in table 1-2.

c. SHIPPING DATA. — The complete complement of equipment for an AN/WRR-2A installation is packed for shipment in two boxes (one wooden, the other pasteboard). The pasteboard box contains Mounting MT-2293A/WRR-2 (mounting cradle). The remaining equipment is packaged in the wooden box. A mounting cradle is not required for installation of the rack-mounted version of the Radio Receiving Set. Therefore, the complete complement of equipment for the AN/FRR-59A is shipped in one wooden box. Shipping data for the AN/WRR-2A and AN/FRR-59A are given in table 1-3.

d. TUBE COMPLEMENT. — Table 1-4 lists all tubes by types, showing the number of each type installed in the major units of the receiver. Semiconductors which function as tubes (except power devices) are included.

TABLE 1-1. EQUIPMENT SUPPLIED

QTY	NOMENCLATURE		OVER-ALL DIMENSIONS (in inches)			VOLUME (cu ft)	WEIGHT (lbs)
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Radio Receiving Set	AN/WRR-2A	23.06	19.80	22.56	8.6	250
1	Mounting	MT-2293A/WRR-2	25.00	22.00	20.63		50
1	Signal IF Cable	W601					
1	Carrier Cable	W602					
1	Power Cable	W603-1					
1	Control Cable	W604					
1	Patch Cord Cable	W624					
1 set	Miscellaneous Cable Connectors						
1 set	Mounting Cradle Hardware						
2	Technical Manuals	NAVSHIPS 94715					
1	Maintenance Standards Book	NAVSHIPS 94715.42					
1	Operating Instructions Chart	NAVSHIPS 94715.21					
1	Radio Receiving Set	AN/FRR-59A	24.47	19.00	22.56	8.6	250
1	Signal IF Cable	W601					
1	Carrier Cable	W602					
1	Power Cable	W603-1					
1	Control Cable	W604					
1	Patch Cord Cable	W624					
1 set	Miscellaneous Cable Connectors						
1 set	Rack Mount Hardware						
1	Panel Filler						
2	Technical Manuals	NAVSHIPS 94715					
1	Maintenance Standards Book	NAVSHIPS 94715.42					
1	Operating Instructions Chart	NAVSHIPS 94715.21					

TABLE 1-2. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY	NOMENCLATURE		USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
1	Headset	NT-49985-A or equivalent	Monitor audio output	600 ohms impedance
1	Antenna	None	Intercepts transmitted RF signals	
as required	Cable, Coaxial	RG10A/U	Transmission line antenna to receiver	50 ohms impedance
as required	Cable, power	THFA or equivalent	Supply primary ac power from local source to receiver	
as required	Cable, power	DHFA or equivalent	Audio output lines	

TABLE 1-3. SHIPPING DATA

BOX NO.	CONTENTS	DIMENSIONS (inches)			VOLUME (cu ft)	WEIGHT (lbs)
		HEIGHT	WIDTH	DEPTH		
RADIO RECEIVING SET AN/WRR-2A						
1	Receiver, miscellaneous hardware, cables, and technical manuals	32	28	31	15.5	348
2	Mounting Cradle	15.5	22.5	35	6.5	78
RADIO RECEIVING SET AN/FRR-59A						
1	Complete complement of equipment	33	28	31	16.0	340

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

a. DESCRIPTION OF PACKAGING AND PACKING METHODS USED FOR AN/WRR-2A.—The major units and accessories comprising Radio Receiving Set AN/WRR-2A are packed for shipment in a wooden box and carton and packaged as follows:

(1) Box 1 contains the assembled receiver, interconnecting cables, plugs for attachment to external cabling, mounting hardware, and two copies of the technical manual.

(2) Box 2 contains the mounting cradle and all hardware required for assembly.

b. DESCRIPTION OF PACKAGING AND PACKING METHOD USED FOR AN/FRR-59A.—The complement of equipment for Radio Receiving Set AN/FRR-59A does not include a mounting cradle.

c. HANDLING.

CAUTION

The extended weight of either or both drawers will tip over the cabinet enclosure if sufficient support is not provided. During installation, check that the receiver cabinets are firmly secured to either the mounting cradle or the relay rack before replacing the drawers. The weight of either drawer alone requires at least two men to remove or replace it safely.

d. MECHANICAL INSPECTION.—A detailed check of the following items may avoid much inconvenience during installation and initial operation:

(1) Check for nuts, washers, or other foreign particles which may be lodged where they could cause a short circuit.

(2) Tighten any screws or nuts which may have worked loose.

(3) Look for broken wires and loose connections.

(4) Operate all mechanical controls through their full range of travel, or in each alternate direction, to detect bent shafts or other evidence of damage.

(5) See that all tubes are well seated in their sockets and that all tube shields are firmly in place. Make sure that antenna coupling fuse F2801 is in its holder in the front panel of the lower deck of the converter. Check F601 on the converter front panel behind the filter cover, and F651 and F652 on the front panel, lower demodulator deck.

2-2. POWER REQUIREMENTS AND DISTRIBUTION.

a. REQUIREMENTS.—See Section 1 quick reference data.

b. PRIMARY CONNECTION.—Application of primary ac power to the receiver requires the attachment of a female connector, which is packed with the receiver, to power cabling of the correct rating. This connector mates with a male fitting, designated POWER IN and mounted externally on the blister at the left rear of the demodulator drawer (see figure 6-6).

c. DISTRIBUTION.—Figure 5-1 shows the distribution of primary power within the equipment.

2-3. INSTALLATION LAYOUT.

The AN/WRR-2A is designed for installation on a standard mounting table or similar flat surface of adequate strength and dimensions. The AN/FRR-59A is designed for relay rack mounting.

a. TEMPERATURE AND VENTILATION.—The equipment will operate normally at ambient temperatures ranging from 0° (+32°F) to +50°C (+122°F). The temperature inside the cabinet may be expected to average 15 degrees above the ambient value. The receiver dissipates heat at the rate of 14.22 BTU per minute. Ventilation is provided by an axial fan located in the upper demodulator deck. A thermostatic control causes the axial fan to operate when the cabinet temperature reaches 112°F ±5°F and to stop at 86°F ±5°F. An adequate supply of reasonably clean fresh air will help the axial fan to perform properly.

b. CABLE LENGTHS.—Transmission line from the antenna to the receiver should be as short as possible.

c. SERVICE ACCESS. (See figures 2-1 and 2-2.)

d. INTERACTION WITH OTHER EQUIPMENT.—One of the principal features of the equipment is its ability to operate normally in an environment close to the antennas of high-powered transmitters. Internal shielding and filtering effectively reduce the danger of interaction with other equipment.

2-4. INSTALLATION REQUIREMENTS.

Installing the AN/WRR-2A consists of assembling and mounting the cradle, fastening the receiver cabinets in the cradle, and completing the necessary cable connections. Installing the AN/FRR-59A consists of fasten-

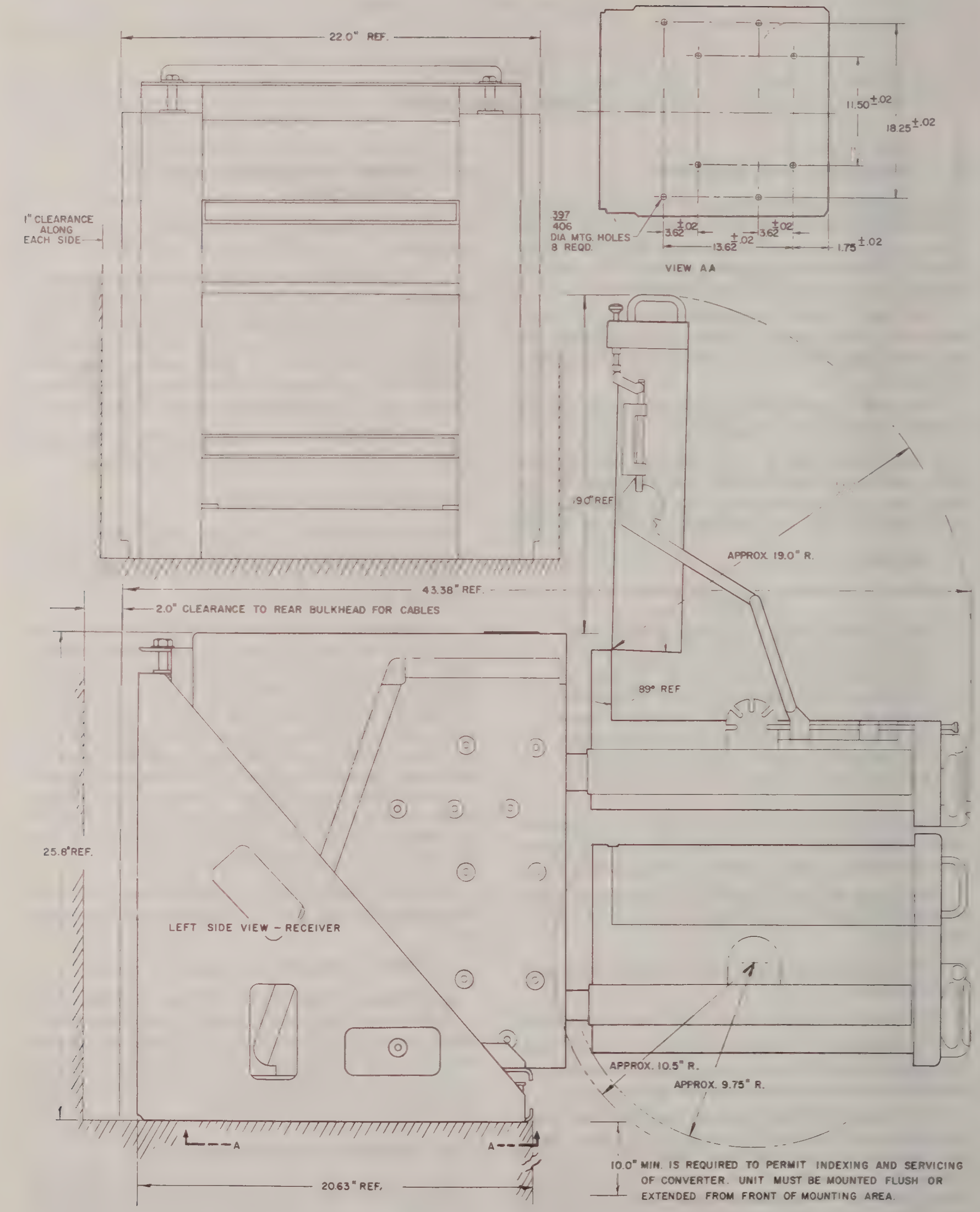

22.0" REF.
1" CLEARANCE ALONG EACH SIDE
11.50 ±.02
18.25 ±.02
.397/.406 DIA MTG. HOLES 8 REQD.
3.62 ±.02
3.62 ±.02
13.62 ±.02
1.75 ±.02
VIEW AA
19.0" REF
APPROX. 19.0" R.
43.38" REF.
2.0" CLEARANCE TO REAR BULKHEAD FOR CABLES
89° REF
25.8" REF.
LEFT SIDE VIEW – RECEIVER
APPROX. 10.5" R.
APPROX. 9.75" R.
A
A
20.63" REF.
10.0" MIN. IS REQUIRED TO PERMIT INDEXING AND SERVICING OF CONVERTER. UNIT MUST BE MOUNTED FLUSH OR EXTENDED FROM FRONT OF MOUNTING AREA.

Figure 2-1. Radio Receiving Set AN/WRR-2A, Outline Drawing

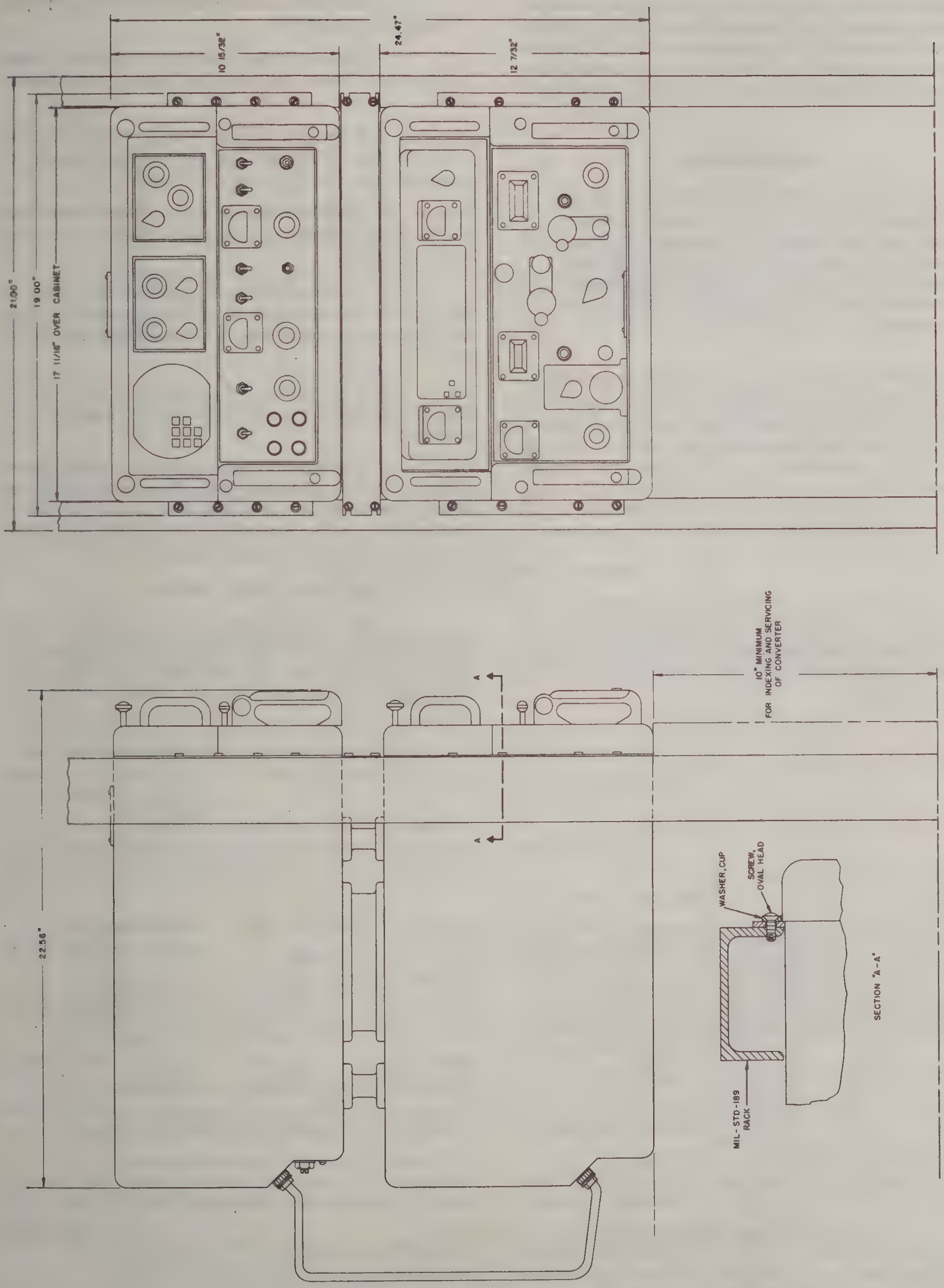

24.47"
10 15/32"
12 7/32"
21.00"
19.00"
17 11/16" OVER CABINET
10" MINIMUM
FOR INDEXING AND SERVICING
OF CONVERTER
A
A
22.56"
WASHER, CUP
SCREW,
OVAL HEAD
SECTION "A-A"
MIL-STD-189
RACK

Figure 2-2. Radio Receiving Set AN/FRR-59A, Outline Drawing

ing the cabinets to the relay rack, adding the panel filter strip, and completing the necessary cable connections. Because the receivers are shipped assembled, it may be necessary to separate the receiver cabinets before moving them to the final installation site (see paragraph 2-1*d*).

WARNING

For safety of personnel, cabinet must be grounded. For AN/WRR-2A receiver, mounting bolt (see figure 2-7) grounds to a metal table. A wood table will require a ground wire. For AN/FRR-59A receiver, flange plates ground cabinet to rack which in turn must be grounded.

a. CABINET ASSEMBLY AND DISASSEMBLY.—Disassembling the AN/WRR-2A receiver cabinets involves removing the drawers, then removing the cabinet side braces, and finally separating the cabinets. The procedure for disassembling the AN/FRR-59A receiver cabinets is similar, the main exceptions being the addition of five spool-shaped spacers and a panel filler that goes between the receiver cabinets and the exclusion of the cabinet side braces.

(1) REMOVAL AND REPLACEMENT OF DRAWERS.—Drawers must be removed before the cabinets can be assembled or disassembled. Procedures for opening, indexing, removing, and replacing drawers are included.

(a) OPENING AND INDEXING DRAWERS. (See figures 2-3 and 2-4.)

1. To open either drawer, use the hand release levers on the lower converter and lower demodulator decks.

2. Raise the handle locking buttons on the lower portion of the handles and pull the handle release levers outward to eject the drawer.

3. Grasp the handles and pull the drawer out on its slides. The drawer will lock in position when fully extended.

4. To index the drawer, pull out the index release knobs and use them to lift the drawer, releasing the knobs when the drawer is at an index angle of 45° or 90°.

5. To lower the drawer, pull out the index release knobs and lower the drawer to its regular level position.

6. To close the drawer, press the index release knobs and push the drawer in by the handles. With the drawer closed, press the handle release levers down to lock the drawer in place. Slide the handle locking buttons down to lock the handle release levers.

(b) RAISING UPPER DECKS.

1. To lift either the upper converter or upper demodulator deck from the extended drawer, grasp the handles of the upper deck and press in on the upper deck-release knobs, just above the handles.

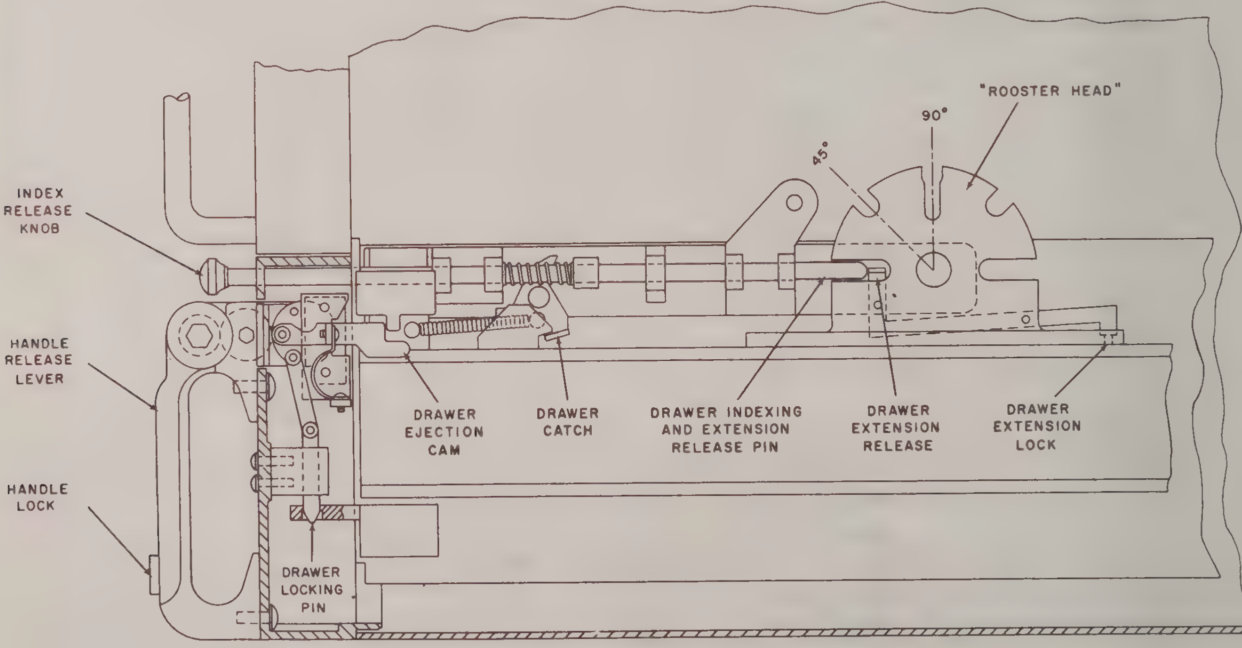


Figure 2-3. Drawer-Operating Mechanism

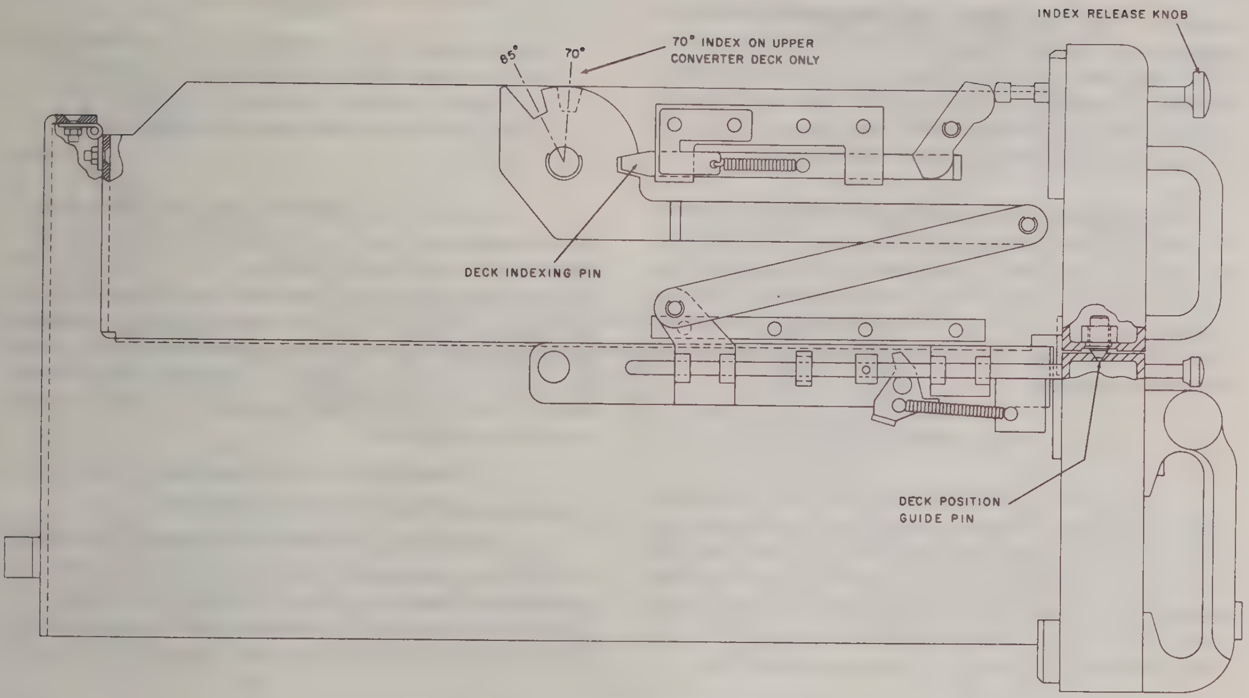


Figure 2-4. Deck-Operating Mechanism

2. Lifting by the handles will place the upper deck at the desired index angle. The upper converter deck will index first at an angle of 70° to avoid striking the receiver panel. When the drawer is removed from the cabinet it is possible to index the upper converter deck to 85°. The upper demodulator deck will index only at an angle of 85°, whether extended or removed from the cabinet.

3. To lower the upper deck, hold the handles firmly while pressing the upper deck release knobs. The deck will then fold down and lock in its normal level position.

(c) REMOVING AND REPLACING CONVERTER DRAWER.

1. Open the drawer and extend it to the end of the slide.

2. Remove the locking blocks at each pivot rooster head.

3. Index the drawer at 45°; remove the twist-lock ac power plug from the rear of the drawer and allow the ac power cable to retract into its housing.

4. Index the drawer at 90°, then lift it straight up until the drawer pivot pins are clear of the grooves. Then tilt the drawer forward to clear the upper drawer panel and remove.

5. To replace the converter drawer, lift it to place the pivot pins in the grooves of the rooster head. Then hold the drawer vertically and lower it into place.

6. Index the drawer at 45°. Reach in for the ac power cable; pull the cable out and place the twist-lock ac plug in its receptacle at the rear of the drawer.

7. Lower the drawer to its level position and replace the locking blocks at each pivot rooster head.

(d) REMOVING AND REPLACING DEMODULATOR DRAWER.

1. Open the drawer and extend it to the end of the slide.

2. Lift the upper demodulator deck to lock it in the 85° index position.

3. Grasp the power cable pulley; pull it down firmly and remove the power cable. Carefully release the pulley, allowing it to rest at the front of the slide.

4. Unlock and remove the power cable connector and pass the power cable through the opening above the cable receptacle.

5. Return the upper deck to its level position.

6. Remove the locking blocks at each pivot rooster head.

7. Index the drawer at 90°; lift straight up until the drawer pivot pins are clear of the grooves, and remove the drawer.

8. Replace the drawer by lowering it vertically to place the drawer pivot pins in their grooves. Lower the drawer to a level position and replace the locking blocks. Lift the upper deck and lock it in the 85° index position. Place the power cable connector in its receptacle and lock it in position. Pull down the pulley on its slide and place the power cable over the pulley. Carefully release the pulley to hold the cable in its normal position. Finally, lower the upper deck to its level position and close and lock the drawer.

(2) REMOVING SIDE BRACES (FOR AN/WRR-2A ONLY).—As shown in figure 2-5 each of the two side braces is affixed to the joined cabinets by eleven ¼-inch hex-head screws. A lock washer and a plain washer accompany each screw. Detach these screws to free the brace from the cabinet side, saving the hardware for reassembly.

(3) SEPARATING THE CABINETS.

(a) RADIO RECEIVING SET AN/WRR-2A. The cabinets are joined by eight screws with accompanying nuts and lock washers. Four ¼-inch hex-head screws pass through circular spacer blocks at the four corners. Four ¼-inch plain screws pass through a ring spacer at the center. Detach these fasteners and lift the upper cabinet from the lower, saving all hardware.

Note

Each corner spacer is fastened to the bottom of the upper cabinet by two screws. The central spacer is similarly attached by four screws. These screws have no nuts and should be left in place.

(b) RADIO RECEIVING SET AN/FRR-59A.—The cabinets used for the AN/FRR-59A are identical to these used in the AN/WRR-2A. In the AN/FRR-59A receiver the cabinets are separated by five spool-shaped spacers (see figure 2-2). The small spacers are used in the corners of the cabinets while the large one is attached to the central spacer. To separate the cabinets, remove all the screws that attach the cabinets to the spool-shaped spacers.

(4) REASSEMBLY.—To reassemble the cabinet structure, reverse the foregoing process.

(5) REMOVAL AND REPLACEMENT OF BLISTERS.—A subassembly in the form of a blister is attached to the rear of each cabinet by sliding snap fasteners. Connectors for external and interconnecting cabling are mounted on the blisters (see figure 2-6). To

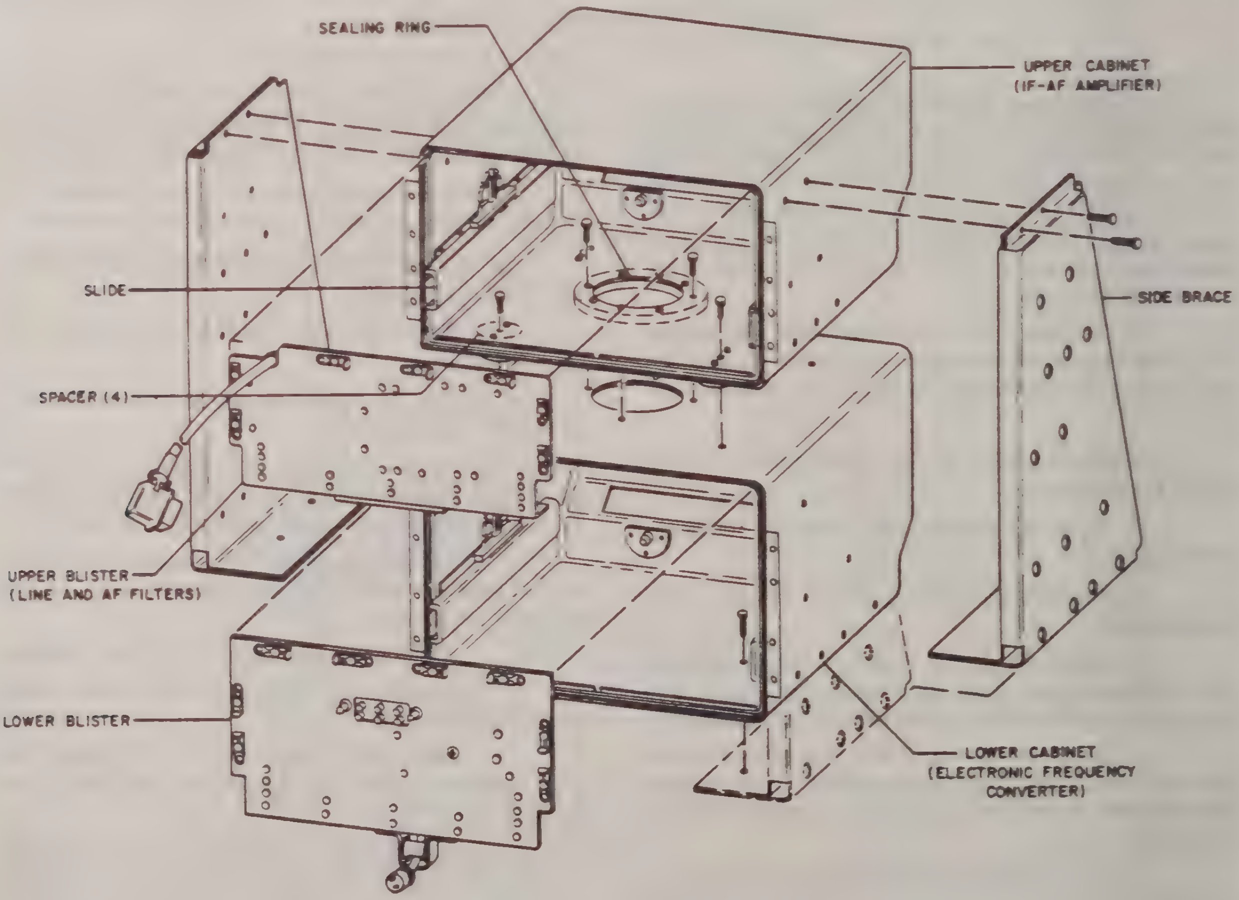

SEALING RING
UPPER CABINET (IF-AF AMPLIFIER)
SLIDE
SIDE BRACE
SPACER (4)
UPPER BLISTER (LINE AND AF FILTERS)
LOWER BLISTER
LOWER CABINET (ELECTRONIC FREQUENCY CONVERTER)

Figure 2-5. Cabinet Mounting Details

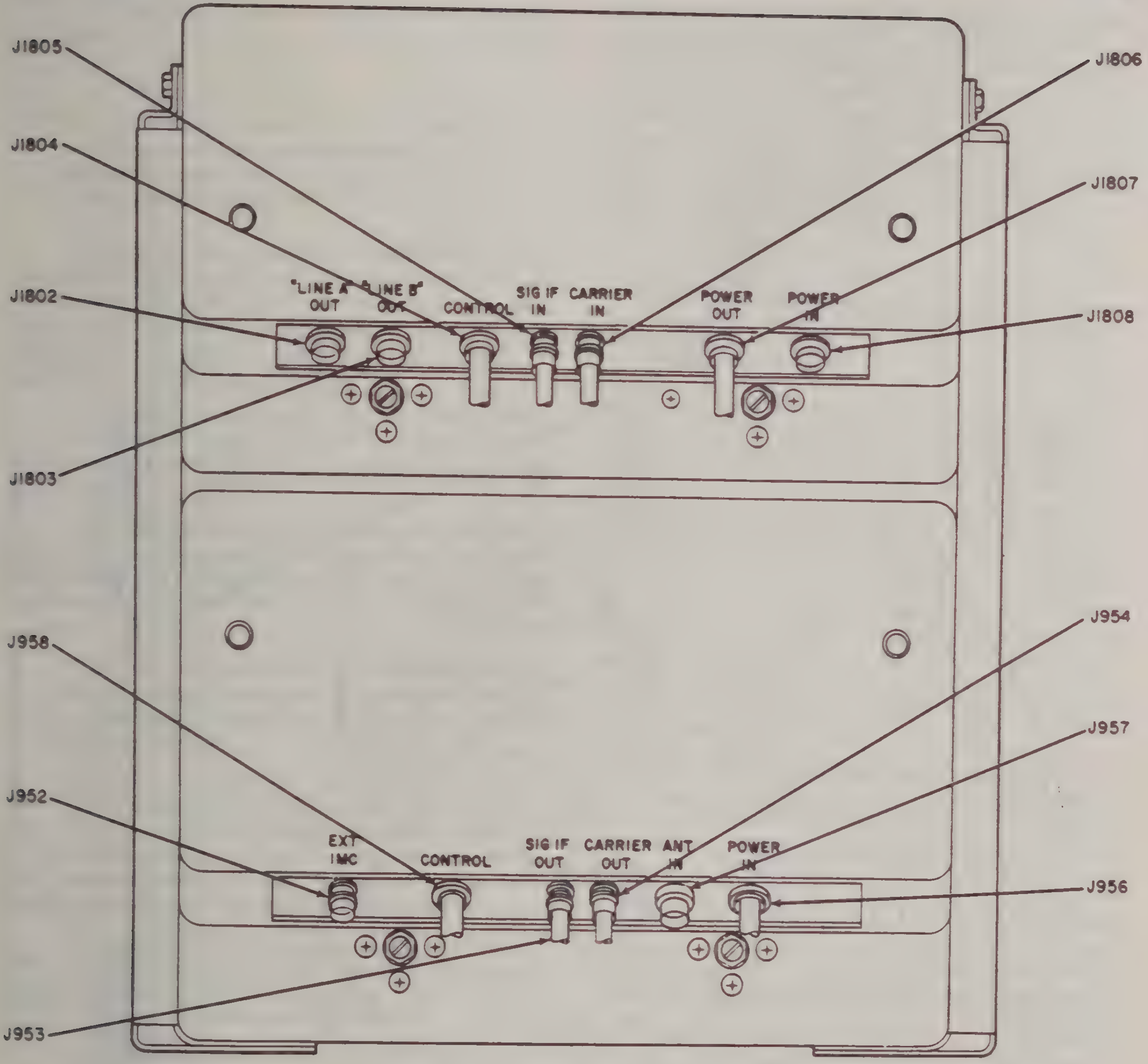

J1805
J1806
J1804
J1807
J1802
"LINE A" OUT
"LINE B" OUT
CONTROL
SIG IF IN
CARRIER IN
POWER OUT
POWER IN
J1808
J1803
J958
J954
J957
J952
EXT IMC
CONTROL
SIG IF OUT
CARRIER OUT
ANT IN
POWER IN
J956
J953

Figure 2-6. External Cable Connections

remove a blister, reach in from the front of the empty cabinet, disengage the fasteners and withdraw the blister through the cabinet, taking care not to damage the connectors. Replace by reversing the process.

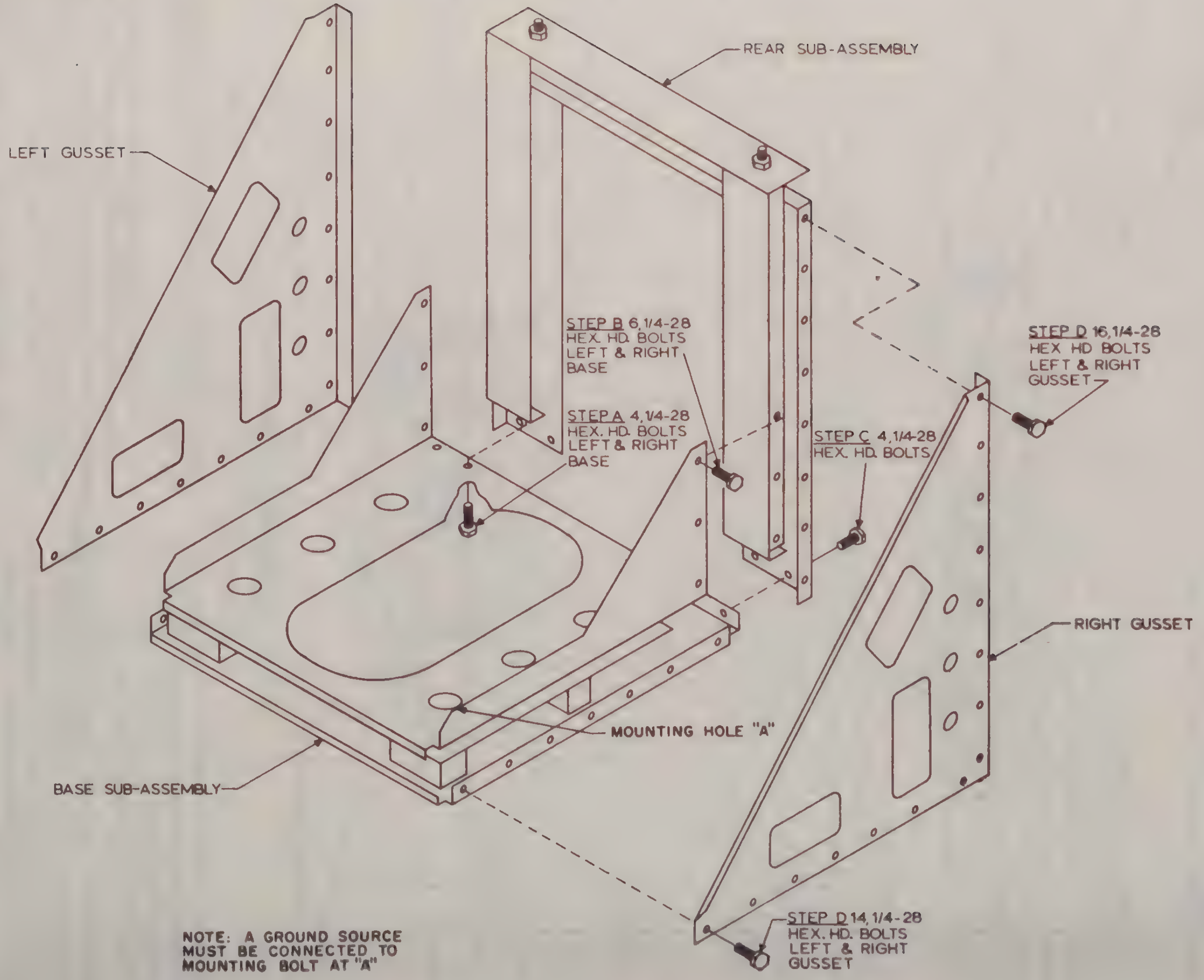
b. MOUNTING CRADLE (FOR AN/WRR-2A ONLY). (See figure 2-7.)—Mounting MT-2293A/WRR-2 consists of a base, a back, and two side gussets for support. It is shipped disassembled in its own carton. Assembly and mounting procedures are as follows:

(1) TABLE LAYOUT.—The base of the mounting cradle has eight holes for attaching the assembly to the supporting table with eight ⅜-inch bolts. Before beginning to assemble the mounting cradle, use the base as a template to locate the holes to be drilled in the table top, as follows:

(a) Place the base on the table in the exact location where it is to be mounted. Make certain that the location permits the necessary clearances given in paragraph 2-3*d.* Align the front of the base flush with, or slightly overhanging, the front edge of the table.

(b) Using the base as a template, insert a 13/32-inch drill into one of the holes and twist it slightly by hand to spot the location on the table top. Do the same with the other seven holes.

(c) Remove the base, and drill the eight holes with a 13/32- or 25/64-inch drill.


REAR SUB-ASSEMBLY
LEFT GUSSET
STEP B 6, 1/4-28 HEX. HD. BOLTS LEFT & RIGHT BASE
STEP A 4, 1/4-28 HEX. HD. BOLTS LEFT & RIGHT BASE
STEP C 4, 1/4-28 HEX. HD. BOLTS
STEP D 16, 1/4-28 HEX HD BOLTS LEFT & RIGHT GUSSET
RIGHT GUSSET
MOUNTING HOLE "A"
BASE SUB-ASSEMBLY
STEP D 14, 1/4-28 HEX. HD. BOLTS LEFT & RIGHT GUSSET

NOTE: A GROUND SOURCE MUST BE CONNECTED TO MOUNTING BOLT AT "A"

Figure 2-7. Mounting MT-2293A/WRR-2, Assembly Details

(d) Do NOT attach the unassembled base to the table.

Note

> It is possible to locate the holes after the mounting cradle has been assembled, but it is less convenient because the complete assembly is heavier and clumsier than the base alone.

(2) MOUNTING CRADLE ASSEMBLY.—The mounting cradle is intended for permanent assembly with 44 hex-head bolts, 1/4 x 28. Four elastic stop nuts are used; all other bolts enter anchor nuts which hold them securely without the need for lock washers. Assemble in the following sequence:

(a) Stand the rear subassembly at the rear of the base, as shown in figure 2-7. Insert four bolts upward through the tray of the base. Install four elastic stop nuts and tighten slightly.

(b) Rising from each side at the rear of the base is a small, solid gusset containing three vertical holes. Align these holes with their mating inserts in the rear subassembly and insert three bolts in each side. Hand-tighten.

(c) The rear subassembly has two pairs of holes at the lower edge near each end. Align these with their mating inserts in the raised lip at the rear of the base and insert four bolts.

(d) Identify the right and left large gussets. Note that the hypotenuse of each gusset has an outward lip, while the vertical edges turn inward to form a partial wrap-around at the rear. Align the holes along the rear and bottom rows in each gusset with their mating inserts in the base and rear subassemblies.

(e) Insert one bolt at each end of the bottom row on each gusset and one bolt at each end of the vertical row at the rear of each gusset. The remaining 11 bolts on each side may now be inserted.

(f) Tighten all bolts securely and evenly.

(3) MOUNTING.—Attach the assembled mounting cradle to the table with eight ⅜-inch bolts, with a washer at each head and nut. A second nut may be tightened against the first to lock it.

e. SECURING THE CABINETS.—The reassembled cabinets, with drawers removed, may now be fastened in place. If rear access at the installation is limited, connect the external and interconnecting cabling as described in paragraph *d* before securing the cabinets. Otherwise, fasten the cabinets with the blisters removed, and make the connections to the blisters (interconnecting cables to one blister only). Run the free ends of the cables through the appropriate cabinet and out the rear, followed by the blisters. After all interconnections have been made, replace both drawers in their respective cabinets.

(1) MOUNTING MT-2293A/WRR-2.—Ten attachment points, tapped at ⅜ x 16 UNC-2B x .75-inch deep, are provided on the mounting cradle. Six points in the base of the cradle receive long screws; four more in the rear subassembly take short screws. Position the cabinets in the cradle, aligning holes in the bottom and rear with the attachment points. Insert screws through their accompanying washers (plain washers first) and through the holes in the cabinet from the inside.

Note

> The plain washer must be placed directly against the head of the screw, with the lock washer following it.

(2) RELAY RACK MIL-STD-189.—The cabinet structures for the AN/FRR-59A have been adapted for mounting in a MIL-STD-189 relay rack by the addition of flange plates. Select a location within the rack which provides the clearances mentioned in paragraph 2-3*d* and shown in figures 2-1 and 2-2. Fasten the empty cabinet structure in place, using 16 oval-head screws and cup washers provided. See Section A-A of figure 2-2 for the correct method of mounting the individual fasteners. Fasten the panel filler strip between the two cabinets using 4 additional oval-head screws and cup washers. Make the external and interconnecting cable connections as mentioned above and replace the drawers in their respective cabinets.

d. CABLE CONNECTIONS.—Although bulk cable is not supplied with the receiver, appropriate connectors (plugs) are furnished for all necessary external cable connections. Interconnecting cables between the converter and demodulator drawers are furnished as complete assemblies. Receptacles for all external and interconnecting cables are located in the recessed panels at the rear of each drawer, as shown in figure 2-6. Table 2-1 contains a summary of the types and functions of all external connecting plugs in their mating receptacles.

(1) ASSEMBLY OF EXTERNAL CABLING.—Figure 2-8 illustrates the method of assembling the JAN-type UG-21/U plug to RG-10/U cable to form the antenna input connection. These instructions are applicable also to the assembly of type UG88C/U plug to RG58C/U cable for use with an external frequency standard. Figure 2-9 shows the assembly method for attaching type AN3106A-16S-5S and type AN3106A-10SL-4S plugs to the appropriate cabling to make up the ac power input and two audio output connectors. Detailed instructions for the assembly of electrical connectors is contained in NAVSHIPS 900171, Chapter 5. Chapter 6 of the same publication gives complete cabling instructions.

The plug provided for the power input cable (P1808) has three female contacts. Contacts A and C connect to the ac line, and contact B goes to ground. The two audio output connectors (P1802 and P1803) have two female contacts each and are ungrounded. The coaxial antenna input connector (P957) contains a male insert for the inner conductor, as does the plug for connection of an external frequency standard (P952).

(2) TRANSFORMER POWER TAPS.—Before operating the receiver, measure with a multimeter the average line voltage of the ship's ac supply. The primary windings of power transformers T901 and T1201, located respectively in the converter and demodulator power supplies, are tapped to permit operation of the receiver from a 60 cps power source of 105, 115, or 125 volts. The taps of the power transformers for these voltages are connected to terminal boards (T901 to TB606, figure 6-5; and T1201 to TB1201, figure 6-8). The connections from power transformer T901 to terminal board TB606 are: (a) terminal 14, common; (b) terminal 15, 125vac; (c) terminal 16, 115vac, and (d) terminal 17, 105vac. The connections from power transformer T1201 to terminal board TB1201 are: (a) terminal 12, common, (b) terminal 13, 105vac, (c) terminal 14, 115vac, and (d) terminal 15, 125vac. The receiver as shipped is connected for 115vac operation (TB606-16 and TB1201-14). If the average value of the ship's ac supply falls between two of the voltages mentioned above, connections for the lower value should be made at both power transformers.

Note

When making these connections, do not move the common connections for T901 or T1201. Always move the hot leads (TB606-15, -16, or -17 and TB1201-13, -14, or -15).

A tag showing the voltage value used should be attached to the power input connector at the rear of the receiver when these connections have been made.

2-5. INSPECTION AND ADJUSTMENTS.

a. GENERAL.—After the equipment is installed and before it is turned over to operating personnel, observe the performance of the receiver in detail and make any necessary adjustments. It is reasonable to expect that these will be minor, but environmental differences between factory and installation site, as well as the handling of the equipment during transit and installation, may set up conditions which will require slight adjustments for optimum performance. All aspects and features of operation must be checked and particular care taken to eliminate any conditions which would lead to abnormal performance.

b. INITIAL ENERGIZING OF EQUIPMENT.

Note

The location of each control is shown in figure 3-1. Table 3-1 gives a brief description of the function of each control.

(1) Make sure that all external connections are tight.

(2) See that connections to power transformers T901 and T1201 are compatible with the average line voltage, as outlined in paragraph 2-4*d*(4).

(3) Set controls as specified in table 5-2.

(4) Set external line power switches to ON.

(5) Turn POWER ON/OFF panel switch to ON and wait 30 seconds. The MEGACYCLE and KILOCYCLE counters should be illuminated immediately. The ventilation blower will probably not be required during the first hour of operation but should be heard running intermittently thereafter.

Note

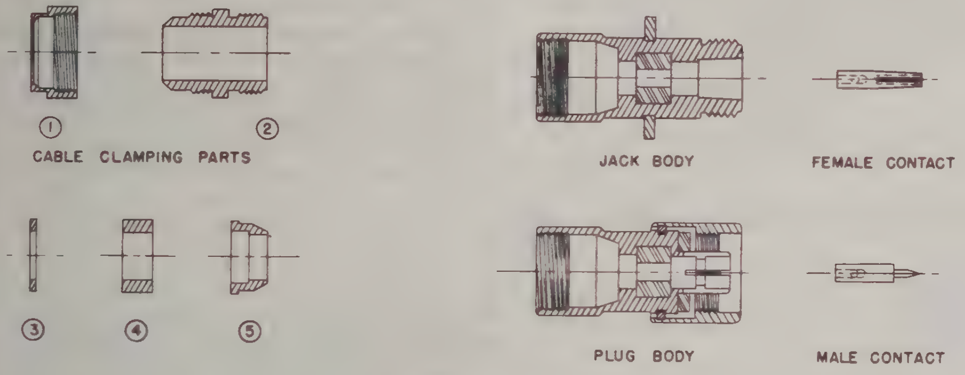
The receiver will be operable after approximately 30 seconds of warmup, but the crystal oscillator may not reach its designed frequency stability of one part in 10^7 until after the first hour of operation.

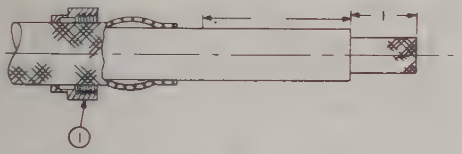
TABLE 2-1. CONNECTORS (PLUGS) SUPPLIED, EQUIPMENT FOR MAKING EXTERNAL CONNECTIONS

CIRCUIT SYMBOL & TYPE OF PLUG	CIRCUIT WHERE USED	TYPE CABLE	CIRCUIT SYMBOL & TYPE OF MATING RECEPTACLE
P1808 AN3106A-16S-5S	105-125 v, 50-60 cps power input	THFA or equivalent	J1808 AN3102A-16S-5P
P1802 AN3106A-10SL-4S	Line A output to terminal equipment or speaker	DHFA or equivalent	J1802 AN3102A-10SL-4P
P1803 AN3106A-10SL-4S	Line B output to terminal equipment or speaker; audio output to speaker		J1803 AN3102A-10SL-4P
P957 UG21B/U	50-ohm antenna input	RG10A/U	J957 UG58A/U
P952 UG88C/U	1 mc external frequency standard input	RG58C/U	J952 UG29C/U

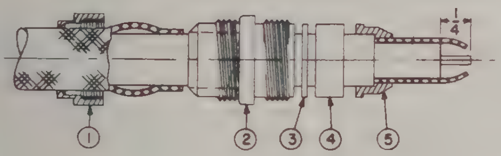
INSTRUCTIONS FOR ASSEMBLY

OF AN TYPE UG-21A/U AND UG-88C/U CONNECTORS TO TYPE RG-10/U AND RG-58C/U CABLE

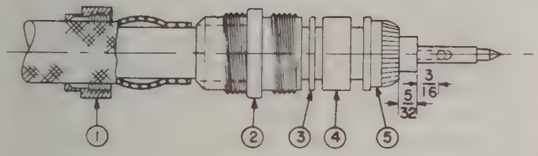




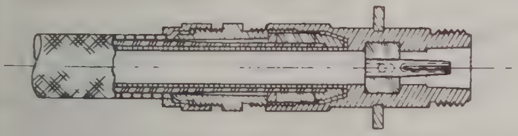
1. SLIDE PART NO. 1 OVER ARMOR AND PUSH ARMOR BACK. CUT VINYLITE OUTER JACKET OFF, SQUARE AND EVEN, ONE INCH FROM END, BEING CAREFUL NOT TO DAMAGE WIRE BRAID.



2. PUSH WIRE BRAID BACK AND CUT OFF 1/4" OF DIELECTRIC. PULL BRAID FORWARD AGAIN AND TAPER INWARD AT END (IF NECESSARY FOR REMAINDER OF THIS STEP). SLIDE PART NO. 2 OVER VINYLITE JACKET AND FOLLOW WITH PARTS NO. 3, 4, AND 5, MAKING SURE THAT NO. 5 CLEARS ALL BRAID WIRES AND THAT ITS INTERNAL SHOULDER RESTS SQUARELY AGAINST END OF JACKET.



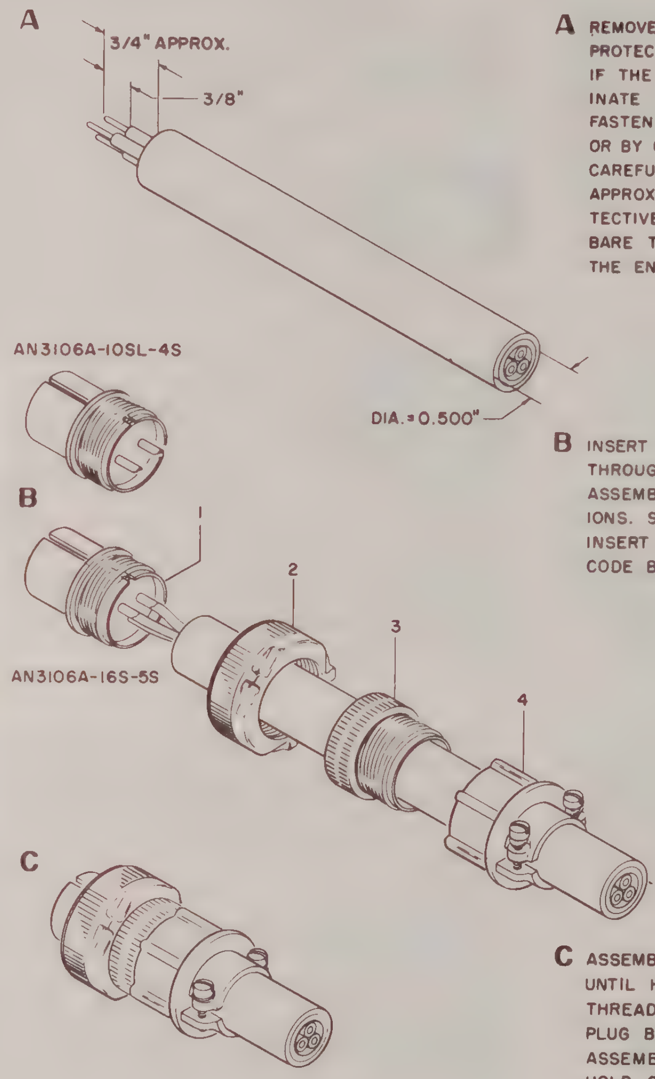
3. UNBRAID ENDS OF WIRE SHIELD AND PULL OUT PARALLEL. THEN FOLD THESE BACK OVER PART NO. 5 AND CUT OFF FLUSH WITH SHOULDER ON THIS PART. CUT OFF DIELECTRIC AGAIN, THIS TIME SO AS TO LEAVE 5/32" OF DIELECTRIC EXPOSED. CUT SQUARE AND EVEN, BEING CAREFUL NOT TO NICK CENTER CONDUCTOR. CUT OFF CENTER CONDUCTOR 3/16" FROM END OF DIELECTRIC AND TIN. SOLDER THIS TIP TO MALE OR FEMALE CONTACT. KEEP SOLDER AND FLUX OFF OF END OF DIELECTRIC, AND REMOVE EXCESS.



4. INSERT CABLE AS ASSEMBLED, IN PLUG OR JACK BODY AS FAR AS IT WILL GO. PUSH PARTS NO. 4 AND 3 INTO BODY, AND SCREW IN PART NO. 2. HOLD BODY WITH WRENCH TO TIGHTEN, USING CARE NOT TO LET BODY OR CABLE ROTATE. PULL ARMOR FORWARD OVER TAPERED PORTION OF PART NO. 2. CUT OFF EXCESS ARMOR AND UNBRAID ENDS FOR A SHORT DISTANCE. BRING PART NO. 1 FORWARD TO CLAMP ARMOR BETWEEN THE TWO TAPERED SURFACES. BE CAREFUL THAT LOOSE ENDS OF ARMOR WIRES DO NOT EXTEND INTO SCREW THREADS AND JAM.

NOTE:
AN TYPE MX-364A/U CONNECTORS MUST BE USED WITH APPROVED CABLE.

Figure 2–8. Antenna Input Connector Assembly



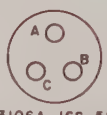
A REMOVE APPROXIMATELY 1 INCH OF THE OUTER PROTECTIVE JACKET FROM THE END OF THE CABLE. IF THE CABLE IS ARMORED, ARMOR SHOULD TERMINATE AT THE SAME POINT AS THE CABLE JACKET. FASTEN CUT END OF ARMOR WITH FRICTION TAPE OR BY OTHER SUITABLE MEANS.
CAREFULLY TRIM BACK ANY SHIELDING TO A POINT APPROXIMATELY 1/4" FROM THE END OF THE PROTECTIVE JACKET.
BARE THE EXPOSED CONDUCTORS FOR 3/8". TIN THE ENDS OF THE CONDUCTORS.

B INSERT THE CABLE PREPARED AS IN STEP A THROUGH CLAMP (4), AND COUPLING RING (2), ASSEMBLY NUT (3), BEFORE SOLDERING CONNECTIONS. SOLDER CONDUCTORS TO CONNECTIONS IN INSERT OF PLUG BODY (1), OBSERVING COLOR CODE BELOW.

C ASSEMBLE BY SLIDING COUPLING NUT FORWARD UNTIL HELD BY RETAINING RING ON PLUG BODY. THREAD FEMALE END OF ASSEMBLY NUT ONTO PLUG BODY, AND FEMALE END OF CLAMP TO ASSEMBLY NUT. TIGHTEN CLAMPING SCREWS TO HOLD CABLE SECURELY.

COLOR CODE CONNECTION DIAGRAM

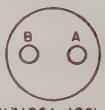
WIRING SIDE OF INSERTS



AN3106A-16S-5S

PIN	COLOR
A	BLACK
B	WHITE
C	RED

WIRING SIDE OF INSERTS



AN3106A-10SL-4S

PIN	COLOR
A	BLACK
B	RED

APPLICABLE CABLES

NAVY TYPE	
TCOP-3,	3-CONDUCTOR, NO.16, OIL RESISTANT, PORTABLE.
THFA-3,	3-CONDUCTOR, NO. 16, HEAT & FLAME RESISTANT, ARMORED.
TRIA-3,	3-CONDUCTOR, NO.16, RESIN INSULATED, ARMORED.
TRIP-3,	3-CONDUCTOR, NO.16, RESIN INSULATED, PLAIN.

ASSEMBLY OF POWER AND AUDIO OUTPUT CONNECTORS

Figure 2–9. Power and Audio Output Connector Assembly

(6) Insert 600-ohm earphones in LINE A PHONES jack.

(7) Rotate R.F. GAIN control clockwise to the maximum clockwise position. Rotate A.M. A.F. LEVEL control clockwise until receiver noise is heard in the phones. Use PHONE LEVEL control to adjust earphone volume to the desired level.

c. TUNING PERFORMANCE.—To observe the performance of the tuning circuits, use a compatible signal generator (e.g., AN/URM-25D) to produce the check signal. Because the frequency accuracy of the receiver exceeds that of most signal generators, calibrate the generator *using the receiver as a reference* before beginning the check, or use a primary frequency standard to set the generator. A third choice involves tuning the generator for a maximum signal in the receiver earphones at each frequency checked. At least one frequency within each primary tuning band should be observed, and both continuous and incremental tuning should be checked. Frequencies selected should be at or near the high or low end of each tuning band.

(1) INCREMENTAL TUNING.—The procedure for tuning the receiver by the incremental method is described in Section 3. The main points of this procedure are incorporated in the following performance check:

(a) With the TUNING switch in the 0.5 KC position and the Band selector switch in the 2-4 position, the MEGACYCLE counter will initially read 02.0. The KILOCYCLE counter should read 00.0.

(b) Adjust signal generator for 30 per cent modulation at 1,000 cps and connect it to the ANT IN jack (J957).

(c) Tune receiver to 4 mc.

(d) Tune signal generator to receiver frequency. Tuning meter dips (minimum indications) should be produced with a reading of 04.0 on the MEGACYCLE counter and 00.0 on the KILOCYCLE counter.

(e) Repeat this procedure using frequencies in each of the four bands. Adjustments of the tuning controls required to produce a meter dip should normally be small. If difficulty is experienced, or if a dip cannot be obtained for any of the selected frequencies, place the TUNING switch in the CONT. position and attempt to tune the receiver by this method. Refer to the trouble-shooting procedures discussed in Section 5, paragraph 5-3*c*. If actual transmitted signals are used for this check, keep in mind that the carrier frequency of the incoming signal may vary considerably from its nominal value. The frequency of the transmitted signal should be measured accurately before apparent discrepancies in the counter readings are attributed to defective tuning circuits or incorrectly set counters. When using the TUNING control and KILOCYCLE counter, it is also important to remember that a dip can be produced at *every* 0.5 kc increment.

(2) CONTINUOUS TUNING.—To receive a frequency having a value terminating in other than a whole or a half kilocycle (for example, 3552.4 kc), use the continuous tuning method. Check this method for at least one frequency, using an actual transmitted signal if possible. If the tuning circuits have performed satisfactorily for all primary tuning bands by use of the incremental method, one frequency should be sufficient to establish the performance of these circuits under continuous tuning. The tuning procedures vary only in the following respects:

(a) TUNING switch is set to the CONT. position.

(b) The MEGACYCLE counter is set to 03.5.

(c) The KILOCYCLE counter is set to 52.4. Tuning adjustments and meter indications are the same, except that a meter dip is not produced at every 0.5 kc.

d. RECEPTION MODES.—Observation of single-sideband and AM reception features requires the use of actual incoming signals or a signal generator. One frequency will suffice to check the performance of the IF and AM audio stages, but it is desirable to check reception of as many AM types (CW, MCW, FSK, facsimile) as are available. Single-sideband voice and teletype transmissions should be observed in both upper and lower sideband channels, if possible.

(1) AM.—Using a signal generator (AN/URM-25D) to furnish the incoming signal, check the AM performance as follows:

(a) Condition the receiver for A1 operation as shown in table 3-2.

(b) Set BAND SELECTOR switch to the 8-16 mc position and tune the receiver to 16 mc.

(c) Adjust R.F. GAIN control for a −12 db reading on the LINE A OUTPUT meter.

(d) Adjust the signal generator for unmodulated output and connect it to the ANT IN jack (J957).

(e) Tune the signal generator to the receiver frequency, and adjust its output to produce a +8 db reading on the LINE A OUTPUT meter, noting the generator output voltage necessary to produce this reading. The voltage should be no greater than 2.5 uv.

(2) SSB.—The performance of the upper and lower sideband channels may be observed as follows:

(a) Condition the receiver for A9 operation (see paragraph 3-2*b*(4) and table 3-3), except for UPPER (or LOWER) A.G.C. switches, which should be left off. Insert 600-ohm phones into LINE A PHONES jack. Tune receiver to any convenient frequency.

(b) Adjust signal generator for unmodulated carrier output and connect to ANT IN jack.

(c) Tune generator until an approximate 1,000 cps tone is heard in the phones.

(d) Adjust A.F. LEVEL LINE A for a −12 db reading on the LINE A OUTPUT meter.

(e) Adjust the signal generator output for a +8 db reading on the LINE A OUTPUT meter. The generator output voltage necessary to produce this reading should not exceed 4 uv.

(f) Shift phones to LINE B PHONES jack and repeat the foregoing steps, except use A.F. LEVEL LINE B and the LINE B OUTPUT meter. Again, the generator output required to produce a +8 reading should not exceed 4 uv.

e. OPERATION OF SPECIAL CIRCUITS.—Devices such as the antenna coupler, beat-frequency oscillator, automatic gain control, silencer, and output limiter, though not essential to receiver operation, nevertheless have specific functions, either to protect the equipment or to enhance its operating efficiency. Conduct initial performance checks on these circuits simply by manipulating their controls and observing the degree to which the designed function is performed.

(1) ANTENNA COUPLER.—Moving the ANT. CPLG. switch from NOR to position 1 should result in a slight reduction of signal strength and, hence, a lower output level. The output level should drop noticeably after each successive resetting of the switch to positions 2 and 3.

(2) BEAT-FREQUENCY OSCILLATOR.—The beat-frequency oscillator generates oscillations which, when heterodyned with 80 kc signals in the first AF amplifier-mixer, provide beat note frequencies required for A1, F4, and F1 reception. An auxiliary vernier adjustment (VAR. B.F.O.) permits variations of the beat frequency output up to approximately 6 kc. Check BFO operation as follows:

(a) Set the RECEPTION switch for AM operation, and set the appropriate controls for A1 reception as shown in table 3-2.

(b) With B.F.O. SELECTOR switch in ON position, tune the receiver to an unmodulated CW (A1) signal, or use a signal generator with unmodulated output. This should result in an audible continuous tone.

(c) A zero beat indicates that the applied IF signal is centered in the passband of the final IF amplifier. A beat note at this setting indicates that the applied IF signal may not be centered in the pass-band of the final IF amplifier. The procedures for adjustment of all BFO functional circuits are described in Section 6.

(d) Using the same signal, rotating the VAR. B.F.O. control to either side of its 0 (center) position should produce a change in the pitch of the beat note. At 0, no beat note should be heard. Rotation from 0 to either side should produce a rising pitch.

(e) F4 and F1 conditions should properly be checked when the receiver is operated in conjunction with facsimile on teletype equipment.

(3) AUTOMATIC GAIN CONTROL.— AGC circuits are associated with each of the three detector-amplifier units, and AGC voltages act on the RF stages of the preselector, the last three stages of the IF amplifier, the tuning meter circuit, and the silencer tube input. Their effect is a regulation of receiver gain in inverse proportion to signal strength. Two time constants suitable for use with various types of AM reception are provided. Table 3-2 presents the settings of the A.M.-A.G.C. TIME CONST. control recommended for each reception type. Two time constants (SLOW and FAST) are provided in each SSB detector-amplifier. With AGC circuits activated and the proper time constant selected, the AF output level should remain fairly constant, once it has been set. If extreme variations in output level are encountered, refer to Section 5, table 5-12, step 6, for AM AGC, table 5-18, steps 6 and 7, for USB AGC, and table 5-26, steps 7 and 8, for LSB AGC.

(4) OUTPUT LIMITER.— With the receiver conditioned for A1 or A2 operation (RECEPTION switch in A.M. position, other controls as in table 3-2), the O.L. THRES. control (potentiometer R1671) can be advanced to provide constant output at a predetermined level. If this constant output is not maintained, refer to Section 5, table 5-12, step 9.

(5) NOISE PEAK LIMITER.— A noise peak limiter is associated with the AM detector. Because it functions only when the B.F.O. is set to OFF, it is not available for other than A2 and A3 signals.

(6) SILENCERS.— Silencing circuits are provided in the AM amplifier unit for use in A3 operation. The operating level of the AM silencer is adjustable through the front panel SILENCER control. AM silencer trouble-shooting procedure is contained in Section 5, table 5-12, step 8.

(7) OPERATION WITH OTHER EQUIPMENT. —The efficiency of the receiver when used with teletype, facsimile, or other terminal equipment should be tested by actual operation. The following points may aid in making the tests meaningful:

(a) Make sure that the terminal equipment is in good operating condition before testing.

(b) Condition the receiver by making control settings in accordance with table 3-2 or 3-3 as appropriate. Be sure that the RECEPTION, B.F.O., and R.F. SELECTIVITY BW-KCS switches are properly set.

(c) When connecting and conditioning the terminal equipment, follow the instructions contained in the technical manuals for such equipment.

(d) Allow ample time for warm-up.

(e) Operate the connected equipments long

enough to allow them to "stabilize" with regard to each other.

2-6. PREPARATION FOR RESHIPMENT.

a. EQUIPMENT DISASSEMBLY.— For disassembly, follow in reverse order the assembly procedures given in paragraph 2-4. Observe the following requirements:

(1) Discharge all capacitors with a grounding probe.

(2) RF cables, when coiled for re-shipment, shall not have loops less than 25 or 30 inches in diameter.

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

Radio Receiving Sets AN/WRR-2A and AN/FRR-59A are high-frequency, superheterodyne receivers employing multifrequency conversion, designed to receive either amplitude-modulated or single-sideband transmissions in the frequency ranges of 2.0 mc to 32.0 mc. They are intended for use in all classes and types of U.S. Navy ships and can be employed for communication between ships and shore stations, ship-to-ship, and between ships and aircraft. Within the designed frequency range, this equipment is capable of receiving the following types of transmissions.

a. A1. On-off keyed CW

b. A2. On-off keyed tone-modulated CW

c. A3. Voice-modulated CW

d. A9. Single sideband

e. F1. Frequency-shift teletype, four-channel multiplex, and frequency-shift data transmissions.

f. F4. Facsimile.

Operation of the receiver is characterized by extreme stability, permitting long periods of unattended operation. A high level of performance can be expected despite adverse environmental conditions.

Several special features of the receiver contribute to its high performance. Any error in frequency resulting from drift in the local oscillator is removed prior to the last conversion by a drift-cancelling circuit. A selection of four tuning bands is provided, and tuning is in 100-kilocycle steps. Through the use of an interpolation oscillator, each 100-kilocycle increment is scanned continuously or in 0.5 kc steps. Counter-type tuning dials permit accurate presetting to a desired frequency.

3-2. OPERATING PROCEDURES.

a. DESCRIPTION OF CONTROLS. — All controls required for normal operation are located on the front panels of the receiver~~, except the .5 KC/CONT. TUNING control which is located behind the filter cover on the converter drawer~~. Controls accessible to the operator but not required for normal operation are listed in paragraph 3-2*d*. Table 3-1 contains a description of the functions of all operating controls and devices, and figure 3-1 shows the location of each panel control.

b. SEQUENCE OF OPERATION. (See table 3-1.)

Note

Before attempting to use this equipment, make sure that all interconnections have been made in accordance with Section 2 (Installation).

(1) STARTING.

(a) Set the POWER switch to ON.

(b) If the desired frequency ends in other than an even 0.5 kc value, set the TUNING .5 KC/CONT. switch to CONT. If the last digit of the desired frequency is an even 1 kc (,or 0.5 kc,) value (for example, 4237.50 kc), set the switch to the .5 KC position.

(c) Set the R.F. GAIN control to the maximum clockwise position.

(d) Set the ANT. CPLG. switch to NOR.

TABLE 3-1. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, FRONT-PANEL CONTROLS

CONTROL MARKING	TYPE OF CONTROL	FUNCTION
POWER ON/OFF	Switch	Applies or removes primary ac power to or from the complete receiving set.
TUNING .5 KC/CONT.	Switch	Selects either continuous frequency tuning or tuning in 0.5 kc increments.
R.F. GAIN	Dual potentiometer	Regulates the gain of the RF and 80 kc IF amplifiers.
ANT. CPLG. NOR/1/2/3	Selector switch	Causes increasing attenuation of RF input signals in the 1, 2, and 3 positions; in the NOR position a protective fuse is placed in the circuit, and no attenuation is inserted.
BAND 2-4/4-8/8-16/16-32	Selector switch	Selects the desired primary frequency band and positions the main tuning-indicator counters to register frequencies covered by the selector band.

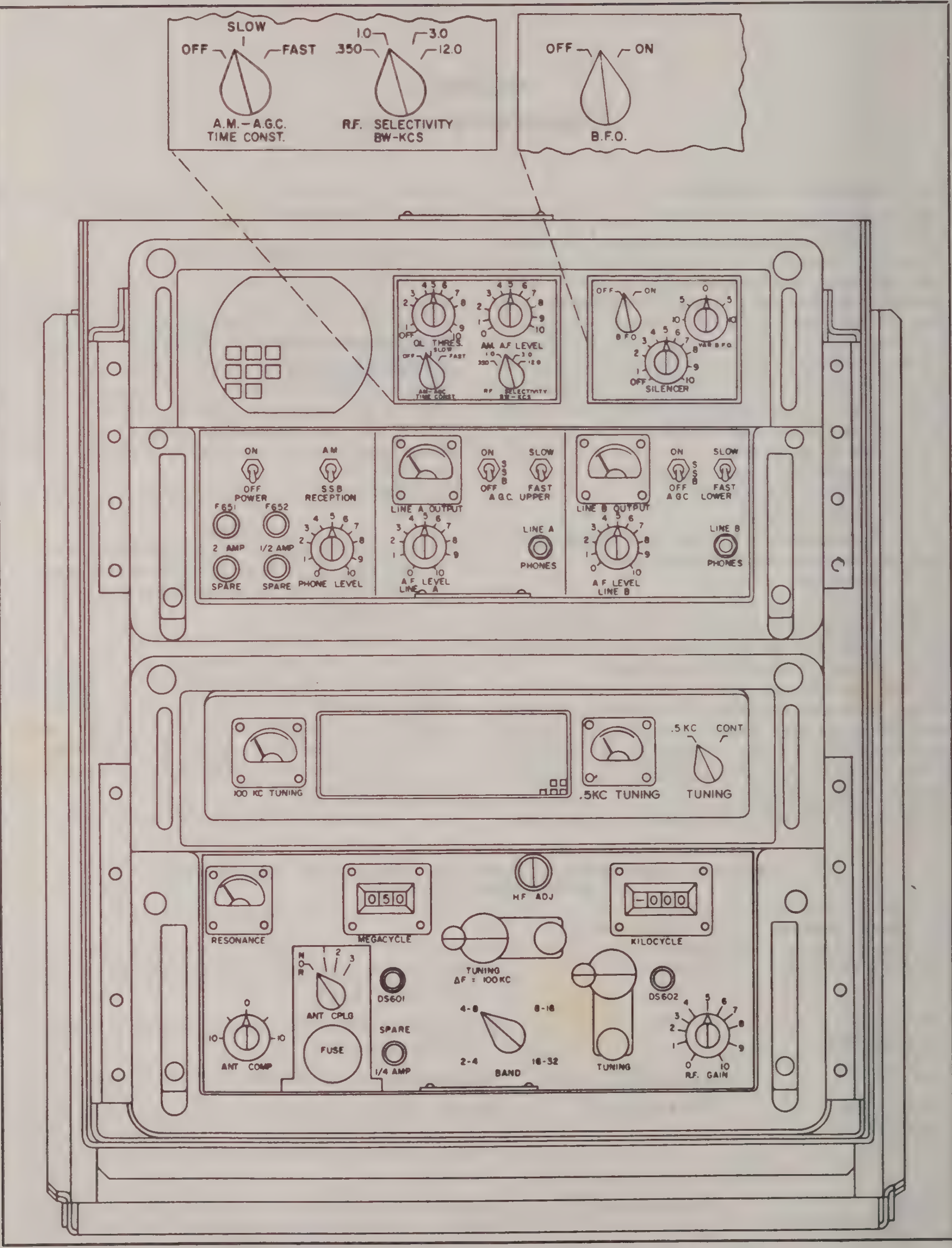

SLOW
OFF
FAST
A.M.-A.G.C.
TIME CONST.
1.0
3.0
.350
12.0
R.F. SELECTIVITY
BW-KCS
OFF
ON
B.F.O.
OL THRES.
AM. AF LEVEL
AM-AGC TIME CONST
RF SELECTIVITY BW-KCS
BFO
VAR BFO
SILENCER
ON
OFF
POWER
AM
SSB
RECEPTION
F651
F652
2 AMP
1/2 AMP
SPARE
SPARE
PHONE LEVEL
LINE A OUTPUT
ON
SSB
OFF
AGC
SLOW
FAST
UPPER
LINE A
PHONES
AF LEVEL
LINE A
LINE B OUTPUT
ON
SSB
OFF
AGC
SLOW
FAST
LOWER
LINE B
PHONES
AF LEVEL
LINE B
100 KC TUNING
.5KC TUNING
.5 KC
CONT
TUNING
RESONANCE
0 5 0
MEGACYCLE
HF ADJ
- 0 0 0
KILOCYCLE
NOR
1
2
3
ANT CPLG
FUSE
DS601
SPARE
1/4 AMP
TUNING
ΔF = 100KC
4-8
8-16
2-4
16-32
BAND
TUNING
DS602
ANT COMP
RF. GAIN

Figure 3-1. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Front View

TABLE 3-1. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, FRONT-PANEL CONTROLS (cont)

CONTROL MARKING	TYPE OF CONTROL	FUNCTION
TUNING △F=100 KC	Variable ganged capacitors	Tunes resonant circuits in steps of 100 kc and selects the correct harmonic from the output of the harmonic generator and amplifier; setting shown on indicator marked MEGACYCLE.
MEGACYCLE	3-digit indicator	Shows setting of the first main tuning control in megacycles; for example: 042=4.2 mc.
TUNING	Variable capacitor	Depending on the position of the TUNING .5 KC/CONT. switch, provides either continuous or incremental tuning through any selected 100 kc increment of tuning to the next-higher 100 kc increment, within the limits of the primary frequency band in use; setting shown on indicator marked KILOCYCLE.
KILOCYCLE	3-digit indicator	Shows setting of second main tuning control in kilocycles and tenths of kilocycles.
100 KC TUNING	Meter	Indicates tuning increments of 100 kilocycles by a dip (minimum indication) of the pointer.
.5 KC TUNING	Meter	Indicates tuning increments of 0.5 kilocycle by a dip of the pointer.
RESONANCE	Meter	Indicates resonance for all modes of reception.
H.F. ADJ.	Mechanical trimmer	Provides tracking of the preselector circuits with the first conversion oscillator circuits.
ANT. COMP.	Variable capacitor	Compensates for variations in input capacitance from one primary frequency band to another.
RECEPTION A.M./S.S.B.	Switch	Conditions the receiver for reception of either AM or single-sideband transmissions; removes power from circuits not required for mode of reception selected.
SILENCER	Potentiometer	Provides silencer action in the AM amplifier for reception of A3 signals.
O.L. THRES.	Potentiometer	Provides continuous adjustment of the threshold of operation of the output limiter.
B.F.O. OFF/ON	Selector switch	In the OFF position, BFO circuits are deactivated; in the ON position, BFO circuits and an auxiliary frequency vernier control (VAR. B.F.O. control) are activated, allowing the tuning of the BFO to be varied.
VAR. B.F.O.	Variable capacitor	Operates only when B.F.O. switch is in ON position; when activated, it operates to vary the tuning of the BFO and hence the frequency of the AF beat note; with VAR. B.F.O. at zero and with a zero-beat audio output, the applied IF signal is centered in the passband of the final IF amplifier.

TABLE 3-1. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, FRONT-PANEL CONTROLS (cont)

CONTROL MARKING	TYPE OF CONTROL	FUNCTION
R.F. SELECTIVITY BW-KCS .350/1.0/3.0/12.0	Selector switch	Selects any of four degrees of final IF selectivity bandwidths; has no effect on single-sideband operation.
A.M.-A.G.C. TIME CONST. OFF/SLOW/ FAST	Selector switch	Functions only when RECEPTION switch is in the A.M. position; in the OFF position, AGC action is reduced to a minimum; the other positions offer a selection of two time constants.
A.M. A.F. LEVEL	Potentiometer	Controls AF signal level in the AM amplifier stage and at line A audio output; functions only when RECEPTION switch is in A.M. position.
A.G.C. UPPER ON/S.S.B./OFF	Two switches	In the ON position, supplies AGC to the preselector circuits common to both sidebands, and slow or fast time constants for the AGC in the upper sideband amplifier.
A.G.C. UPPER SLOW/FAST		In the S.S.B. position, AGC is supplied *only* to the upper-sideband amplifier. In the OFF position all AGC voltage is grounded.
A.G.C. LOWER ON/S.S.B./OFF A.G.C. LOWER SLOW/FAST	Two switches	Provides AGC voltages on the same basis to the lower-sideband amplifier and preselector circuits in the ON position. In SSB position, only the lower-sideband amplifier is provided with AGC. All AGC voltage is grounded in OFF position. Slow or fast time constants are available.
A.F. LEVEL LINE A	Potentiometer	Controls the output level of upper sideband-detected audio when RECEPTION switch is set to S.S.B. position.
A.F. LEVEL LINE B	Potentiometer	Controls the output level of lower sideband-detected audio when RECEPTION switch is in S.S.B. position.
LINE A OUTPUT	Meter	Indicates AF level in decibels across LINE A OUTPUT terminals.
LINE B OUTPUT	Meter	Indicates AF level in decibels across LINE B OUTPUT terminals.
LINE A PHONES	Jack	Provides facility for monitoring the output of the AM amplifier when RECEPTION switch is in the A.M. position; with the RECEPTION switch in the S.S.B. position, it monitors the output of the upper-sideband amplifier.
LINE B PHONES	Jack	Provides facility for monitoring the output of the lower-sideband amplifier when RECEPTION switch is in S.S.B. position.
PHONE LEVEL	Potentiometer	Adjusts the AF signal level applied to LINE A and LINE B PHONES jacks.

(2) TUNING.—Assume that the desired frequency is 4.235 mc.

(a) Set the BAND selector switch to 4-8.

(b) Use the $\triangle F = 100$ KC knob to set 04.2 mc on the MEGACYCLE counter.

(c) Adjust the TUNING $\triangle F = 100$ KC control for minimum indication of 100 KC TUNING meter pointer.

(d) Use the TUNING control to set the KILOCYCLE counter to the last three digits of the desired frequency, that is, to 35.0 kc.

(e) Adjust the TUNING control for a minimum indication of the .5 KC TUNING meter pointer.

(f) Set the H.F. ADJ. control for a maximum indication of the RESONANCE meter pointer.

(g) Adjust the ANT. COMP. control for a maximum indication of the RESONANCE meter pointer.

(3) AMPLITUDE-MODULATED OPERATION.—For the reception of A1, A2, A3, F1, and F4 signals, set the RECEPTION switch to A.M. Table 3-2 sets forth the recommended control settings for the various types of signals.

(4) SINGLE-SIDEBAND OPERATION.—Reception of A9 (single-sideband) signals can be in either the upper or lower sideband. In some cases both sidebands may be used with either identical or different types of information. For example, the upper and lower sidebands could carry two different voice-modulated signals, or one sideband could carry a voice-modulated signal and the other a facsimile signal. Controls for the upper and lower sideband demodulators are identical and can be discussed as one set of controls.

(a) Set the RECEPTION switch to S.S.B.

(b) Make control settings according to the type of reception desired, as shown in table 3-3.

(5) OTHER OPERATING ADJUSTMENTS.

(a) USE OF PHONES.

1. AMPLITUDE MODULATION.—Insert the phone plug into the jack marked PHONES LINE A. With the RECEPTION switch set to A.M., the line A audio output is controlled by the A.M. A.F. LEVEL control.

2. UPPER SIDEBAND.—The PHONES LINE A jack is also used for this mode of operation (RECEPTION switch in S.S.B. position). The line A audio output is now controlled by the A.F. LEVEL LINE A control.

3. LOWER SIDEBAND.—In this case use PHONES LINE B jack and the A.F. LEVEL LINE B control.

4. PHONE LEVEL. —The output level to the phones for LINE A and LINE B PHONES jack is controlled simultaneously by the PHONE LEVEL control.

(b) USE OF THE ANTENNA COUPLER.—For normal reception conditions, place the ANT. CPLG. selector switch in the NOR position. In this position, a fuse protects receiver circuits from damage if strong signals induce a high voltage in the antenna. If the fuse blows during operation, place the switch in the

TABLE 3-2. CONTROL SETTINGS, AM OPERATION[1]

CONTROL MARKING	TYPE OF RECEPTION SELECTED				
	A1	A2	A3	F1	F4
SILENCER	OFF	OFF	ON[2]	OFF	OFF
O.L. THRES.	ON[3]	ON[3]	OFF	OFF	OFF
B.F.O.	ON[4]	OFF	OFF	ON	ON
R.F. SELECTIVITY BW-KCS[5]	1.0	3.0	12.0	3.0	3.0
A.M.-A.G.C. TIME CONST.	OFF	OFF	FAST	FAST	FAST
A.M. A.F. LEVEL	10 (max)	10 (max)	Adjust as required	Adjust as required	Adjust as required
R.F. GAIN	Adjust as required	Adjust as required	10 (max)	10 (max)	10 (max)

[1] All settings are based on the characteristics of the receiver. Experience will indicate optimum settings.

[2] For A3 reception, increase SILENCER action until desired signal is no longer audible. Then decrease until signal is again heard. When setting for a weak signal, make allowance for fading. If more than one signal is being received, set for the weakest signal.

[3] Set for normal output level during reception.

[4] In ON position, an audio note of 0 kc to 3 kc may be chosen for the beat-frequency output. In A1 position the audio output is a constant 1 kc beat frequency.

[5] Setting is based on normal reception conditions. Use a narrow bandwidth for difficult reception conditions.

TABLE 3-3. CONTROL SETTINGS, SSB OPERATION

CONTROL MARKINGS		TYPE OF RECEPTION SELECTED	
		VOICE MODULATED	FACSIMILE OR TELETYPE
A.G.C. UPPER (or LOWER)	ON/S.S.B./OFF SLOW/FAST	ON[1] SLOW	ON[1] FAST
A.F. LEVEL LINE A (or LINE B)		Set for desired output level as indicated by LINE A OUTPUT (or LINE B OUTPUT meter).	

[1] Set to ON for normal signals. Turn to OFF if sharper receiver alignment is required. For simultaneous reception in both sidebands (e.g., FSK RATT and voice) use ON position for FSK and S.S.B. position for voice.

1, 2, or 3 position and use the attenuated signal. Distortion caused by strong local transmitter signals may also be eliminated by the use of this control.

(6) AFTER USE.—No provision is made for a "stand-by" condition of the receiver. After or between periods of actual reception the equipment may be allowed to remain energized without risk of damage. The following steps are dictated by good operating practice:

(a) Adjust the R.F. GAIN and A.F. LEVEL controls to a medium or low setting.

(b) Set the SILENCER or O.L. THRES. control to reduce the noise level at the receiving station.

(c) Disconnect the phones, loudspeaker, or terminal equipment.

(d) Log any abnormal performance or indication noted during the period of operation.

(e) Perform maintenance checks as described in the Maintenance Standards Book (NAVSHIPS 94715.-42) for the equipment.

(7) SECURING THE RECEIVER.

(a) Turn the R.F. GAIN and A.F. LEVEL controls fully counterclockwise.

(b) Place the POWER ON/OFF switch in the OFF position.

c. INDICATOR PRESENTATIONS.

(1) TUNING INDICATIONS.—The principal indications of interest to the operator are those of the MEGACYCLE and KILOCYCLE counters, associated with the main tuning controls, and those of the RESONANCE and TUNING meters. The general function of these and their associated controls is described in table 3-1. Paragraph 3-2*b*(2) outlines the tuning procedure to be followed, using a frequency of 4235.0 kc (4.235 mc) as an example. For a more detailed observation of the various tuning indicators, assume that the desired signal frequency is now 16,252.4 kc (16.2524 mc). The TUNING switch must be set to the CONT. position and the BAND selector switch placed on 16-32. The MEGACYCLE counter will now be positioned to indicate frequencies within this band, but it must be adjusted further to show the exact frequency desired.

(a) Rotate the TUNING $\triangle F = 100$ KC control until the digits 1, 6, and 2 appear in sequence from left to right on the three drums of the MEGACYCLE counter. The direction of rotation necessary to make the setting will depend on the relative position within the band to which the drums were first positioned by the BAND selector switch.

(b) Observe the 100 KC TUNING meter. Correct setting of the tuning control will be indicated by a deflection of the meter pointer from its full-scale position left towards the zero position. Slight adjustment of the tuning control may be necessary to bring about this dip of the pointer.

(c) Rotate the TUNING control until the digits 5, 2, and 4 appear from left to right on the three counter drums of the KILOCYCLE counter. (Actually, there are four drums, the extreme left one functioning only to indicate when the counter setting is above or below the tuning range of the interpolation oscillator.)

(d) Figure 3-2 shows the correct settings of the tuning counters for the above frequency and illustrates the accompanying indications of the RESONANCE and TUNING meters.

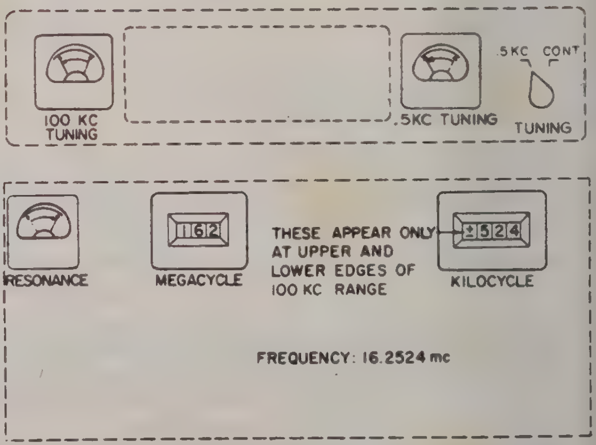


Figure 3-2. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Tuning Counter Presentations

(e) Set the H.F. ADJ. and ANT. COMP. controls in succession, observing the RESONANCE meter for a maximum meter indication at each setting.

(2) OUTPUT-LEVEL METERS. — These two meters, calibrated in decibels from −12db to 0 to +22 db, give a visual indication of the AF output levels across the output terminals. Marked LINE A OUTPUT and LINE B OUTPUT, they respond to adjustments of the A.F. LEVEL LINE A and A.F. LEVEL LINE B controls, respectively, when the receiver is conditioned for SSB reception. If outputs are taken simultaneously from line A and line B, the meters can be used to determine when the output levels are equal. When receiving AM signals, the A.M. A.F. LEVEL control is used to regulate output, which is indicated on the LINE A OUTPUT meter.

d. NONOPERATING CONTROLS. — The following controls, which are accessible to the operator, have been installed primarily for the use of technicians in adjusting and calibrating the receiver. Under normal operating conditions, the settings of these controls should not be changed except by a qualified technician.

(1) Master oscillator adjustment control (INTERNAL STANDARD ADJUSTMENT)

(2) Master oscillator logging indicator (INT. STD. LOG)

(3) Master oscillator phase-temperature switch (INT. STD.)

(4) External-internal standard switch (FREQ. STAND.)

(5) Upper-sideband gain adjust control (UPPER GAIN BAL.)

(6) Lower-sideband gain adjust control (LOWER GAIN BAL.)

Note

> The FREQ. STAND. switch, located under the cover plate of the upper converter deck, must be set to the INT. STD. position before the receiver is operated. The EXT. STD. position should be used only if the internal frequency standard fails, or if an accuracy of better than 1 part in 10^7 is required.

3-3. EMERGENCY OPERATION.

a. PARTIAL FAILURE. — Normally, good maintenance procedure requires that electronic equipment be shut down for repairs as soon as any significant defect develops. In an emergency situation, however, loss of the services of the equipment for any length of time may not be acceptable, and a substitute method of operation must be found. This substitute, or emergency method will, in most cases, involve a reduction of receiver capability. If no alternate equipment is available, the lower operating efficiency will have to be accepted. Once the pressing need for the receiver has passed, however, steps should be taken promptly to restore it to normal operation. Subject to the foregoing, the emergency operating procedures listed below are suggested.

(1) ANTENNA COUPLER. — As noted in paragraph 3-2*b*(5)*(b)*, placing the ANT. CPLG. switch in position 1 will renew the signal path in the event that protective fuse F2801 is opened by a high current. A reduction in signal strength must be expected.

(2) RECEPTION OF SSB TRANSMISSIONS WITH A.M. DETECTOR-AMPLIFIER. — In case of failure in either of the single-sideband detector-amplifier sections, the sideband intelligence can still be received by use of the A.M. detector-amplifier, except that simultaneous upper- and lower-sideband reception will not be possible. The following procedural steps will permit reception of one sideband channel:

(a) Set the RECEPTION switch to A.M.

(b) Place the TUNING .5 KC/CONT. switch in the CONT. position.

(c) Adjust the R.F. GAIN control to a low setting.

(d) Adjust the A.M. A.F. LEVEL control to a high setting.

(e) Using the TUNING control, tune the receiver to the sideband frequency. Slight resetting of the H.F. ADJ. control may also be necessary. At this point the signal heard will be unintelligible.

(f) Set the B.F.O. switch to the ON position.

(g) Using the VAR. B.F.O. control, tune the BFO until the signal becomes intelligible and normal in pitch.

(h) If a teletype signal is being transmitted, the printer must be observed while the BFO is being tuned.

(3) AM RECEPTION WITH SSB DETECTOR-AMPLIFIER. — The upper- or lower-sideband detector-amplifiers can be used also for A3 reception in the event of failure in the AM unit. The following procedure should be used:

(a) Set the RECEPTION switch to S.S.B.

(b) Set the TUNING .5 KC/CONT. switch to CONT.

(c) Adjust the R.F. GAIN control to a low setting.

(d) Adjust the appropriate SSB A.F. LEVEL control (A.F. LEVEL LINE A or LINE B) to a high setting.

(e) Using the main tuning controls, tune the receiver to the carrier frequency.

(f) Readjust the TUNING control until the signal becomes intelligible and normal in pitch. Adjustment of the H.F. ADJ. control may also be necessary.

(4) LOSS OF INCREMENTAL TUNING. — Inability to tune the receiver by means of the incremental tuning circuits requires that the TUNING .5 KC/CONT. switch be placed in the CONT. position. Drift cancellation is not a feature of this tuning method,

and the resultant slight loss of frequency stability may demand more frequent tuning adjustment, especially during reception of SSB signals. This small reduction of stability will occur in any case where continuous tuning is substituted for the incremental method.

(5) LOSS OF AGC VOLTAGE. — Failure of AGC circuits within the receiver will not interrupt the signal flow, and the set should remain operative but subject to strong signal overloading. Silencer action, which is actuated by AGC voltage, will be lost. Manual control of output through the R.F. GAIN and appropriate A.F. LEVEL controls will be necessary. AGC and silencer switches in the affected section should be turned off. It should be kept in mind that, although the AGC circuits in the single-sideband sections operate in combination, the AM and single-sideband AGC circuits cannot be substituted for each other. The RECEPTION switch inactivates these circuits in the section not being used.

TABLE 3-4. SUMMARY OF OPERATION FOR RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A

1. STARTING THE RECEIVER	
Step 1	Place the POWER ON/OFF switch to ON position, making certain that the FREQ. STAND. switch is set to INT. STD.
Step 2	If the desired frequency ends in a whole or half kilocycle, set the TUNING .5 KC/CONT. switch to .5 KC; otherwise set it to CONT.
Step 3	Set the R.F. GAIN control to near maximum (clockwise).
Step 4	Set the ANT. CPLG. switch to NOR.
2. TUNING	
Step 1	Set BAND selector switch to position covering desired frequency.
Step 2	Rotate TUNING $\triangle F = 100$ KC control until first three digits of desired frequency appear on drums of MEGACYCLE counter. (First digit will be zero if frequency is less than 10 mc.)
Step 3	Adjust TUNING $\triangle F = 100$ KC control for a minimum indication of the 100 KC TUNING meter pointer.
Step 4	Rotate TUNING control until last three digits of desired frequency appear on drums of KILOCYCLE counter. (Last digit will be zero or five if 0.5 kc incremental tuning is used.)
Step 5	Adjust TUNING control for a minimum indication of the .5 KC TUNING meter pointer, when the receiver is set for 0.5 kc tuning.
Step 6	Set H.F. ADJ. control for a maximum indication of the RESONANCE meter pointer.
Step 7	Set ANT. COMP. control for a maximum indication of the RESONANCE meter pointer.
3. AMPLITUDE-MODULATED OPERATION	
Step 1	Set RECEPTION switch to A.M.
Step 2	Set other controls as required for type of reception (see table 3-2).
4. SINGLE-SIDEBAND OPERATION	
Step 1	Set RECEPTION switch to S.S.B.
Step 2	Set other controls as required for type of reception (see table 3-3).
5. STOPPING THE RECEIVER	
Step 1	Turn R.F. GAIN control fully counterclockwise.
Step 2	Set POWER ON/OFF switch to OFF.

(6) POWER FAILURES. — Interruption of the primary ac power supply to the receiver can be remedied only by an alternate power source. Most shipboard power distribution systems provide for an alternate power transmission path. An emergency power system, comprising an independent generator, distribution switchboard, and transmission lines to vital equipment, may also be available in larger vessels. The operator must be familiar with the ship's installation and be able to shift quickly to alternate or emergency sources having the same electrical rating.

b. OPERATION IN THE PRESENCE OF JAMMING.

(1) RECOGNITION AND IDENTIFICATION OF JAMMING. — Generally speaking, jamming is a deliberate attempt by an enemy agency to prevent the reception of transmitted intelligence. It is a simple operation, involving the emission of a strong signal at or near the frequency of the communication channel. Unusual sounds emanating from a receiver may be caused by jamming, accidental interference from a local friendly station, or by a defect within the receiving equipment. Confusion as to the cause of the sounds may lead the operator to shut down the receiver in the presence of jamming or interference in the mistaken belief that the set is defective. Disconnecting the antenna from the receiver is an easy way to determine whether the sound is being generated by a defective receiver stage. If the sounds continue, the receiver is probably defective.

(2) TYPES OF JAMMING. — Jamming signals are classified broadly as continuous-wave or modulated. Modulated signals may take a variety of forms. A brief description of the two main classifications, and some of the more successful types of modulated signals, is presented in the following paragraphs:

(a) CONTINUOUS-WAVE JAMMING. — A steady, unmodulated carrier is often used. This carrier can be made to beat with the carrier of the communication channel, producing a loud, steady tone signal in the receiver headphones. On-off keyed carrier may also be used, involving either random keying or the transmission of actual code characters.

(b) MODULATED JAMMING. — A great variety of modulation forms can be used effectively, including music, noise, conversation, and tone combinations. Some of the more efficient forms are as follows:

1. SPARK. — This signal is simple, effective, and easily produced. The resultant sound resembles the noise of an electric motor operating with sparking brushes. The signal is broad and may cover a fairly wide band of frequencies.

2. SWEEP-THROUGH. — A carrier is swept back and forth across the communication channel frequency at a varying rate. The resultant sound resembles that of low-flying aircraft passing overhead. This signal is also effective over a wide band of frequencies.

3. STEPPED TONES (BAGPIPES). — A set of separate tones, repeatedly transmitted in order of first increasing and then decreasing pitch, produces the bagpipe effect.

4. NOISE. — Considered one of the most effective forms of jamming modulation, noise is random in both amplitude and frequency. The resultant sound is similar to that produced when the receiver is detuned from a station and the gain controls are set at maximum.

5. GULLS. — A quick rise and slow fall of the variable audio frequency produces a sound similar to the cry of sea gulls.

6. TONE. — The jamming signal may consist of a single audio frequency of unvarying tone, producing a steady howl in the receiver headphones. The tone may also be varied slowly, producing a howl of varying pitch.

(3) ANTIJAMMING PROCEDURES. — As soon as the presence of jamming is recognized or suspected, immediately notify the superior officer and *continue to operate the receiver.* Continued operation is a basic principle of antijamming techniques, for, if the jammed equipment is shut down, the enemy has accomplished his purpose. The following procedures are based on general communications practice, plus a consideration of the design features and controls of the AN/WRR-2. Tactical considerations and fleet doctrines concerning communications countermeasures must also be applied by responsible personnel and must govern in cases of conflict with this manual.

(a) Continue to operate the receiver as outlined in paragraph 3-2*b*.

(b) If the jamming signal is very strong in relation to the desired signal, use attenuation positions 1, 2, or 3 of the ANT. CPLG. control. The inserted attenuation will tend to prevent blocking of the receiver RF stages.

(c) Set the R.F. SELECTIVITY BW-KCS control to the narrowest bandwidth consistent with the type of reception in use.

(d) Detune the receiver very slightly to either side of the desired signal. This may cause some separation of the desired signal from the jamming signal. Use continuous tuning for this procedure. Its effectiveness is dependent largely on the bandwidth of the jamming signal.

(e) If the intelligence desired is in the form of A1 signals, place the B.F.O. switch in ON position and use the VAR. B.F.O. control to vary the pitch of the desired signal. The pitch separation may prove helpful in copying the A1 signals.

(f) A high setting of the O.L. THRES. control may tend to improve the signal-to-noise ratio during noise-modulated jamming of A1 signals.

(g) Vary the R.F. GAIN control. This may reduce the level of the jamming signal enough to permit the weaker desired signal to be heard.

(h) Vary the appropriate A.F. LEVEL control. The level of the desired signal may be raised enough to be heard.

(i) Keep in mind that the success or failure of the above measures will depend largely on the signal-to-noise ratio between the desired signal and the jamming signal, also on the bandwidth of the jamming signal versus that of the desired signal. A combination of these control settings may work, even though the individual steps were unsuccessful.

(j) Single-sideband channels, because of their extremely narrow bandwidth, may prove to be relatively invulnerable to broadband noise-modulated jamming. If conditions permit, and AM reception is effectively jammed, a shift to single-sideband mode should be considered.

(k) If the communication channel remains jammed after all possible combinations have been tried, action should be taken in accordance with current doctrine to obtain a shift of operation frequency. If possible, the new frequency should be well outside the apparent bandwidth of the jamming signals.

(l) At the first opportunity, make an accurate record of the signal characteristics and apparent effectiveness of the jamming signals, as well as the success or failure of each antijamming measure attempted.

3-4. OPERATOR'S MAINTENANCE.

a. GENERAL. — Electronic technicians are generally responsible for the maintenance and repair of this receiver. In order to lighten the work load of the technician group, routine items of preventive maintenance which do not require elaborate or precision-type test equipment are normally assigned to the operator. Trouble-shooting and repair of minor defects may also be required of operating personnel from time to time. In order to meet this responsibility, a thorough knowledge of the equipment, including complete familiarity with the function of all controls and the procedures governing their use, is mandatory. A general knowledge of circuit theory should also be acquired, so that the existence, location, and probable cause of any electrical or mechanical failure may be determined promptly. In this manner, minor troubles can often be corrected before they become serious. Under normal operating conditions, however, repairs requiring complex realignments should be accomplished by experienced personnel.

b. OPERATING CHECKS AND ADJUSTMENTS.

(1) SHIFTING FREQUENCY. — Repeat all steps of the tuning procedure listed in table 3-4.

(2) CHANGING TYPE OF RECEPTION. — With the RECEPTION switch in A.M. position, set controls for the new type of reception as indicated in the appropriate column of table 3-2.

(3) CHANGING RECEPTION MODE (AM to SSB).—Set the RECEPTION switch to S.S.B. Set controls as shown in table 3-3.

(4) RESONANCE. — The 100 KC TUNING meter should remain in a "dip" once the receiver has been tuned. (With continuous tuning, no dip will be experienced in the .5 KC TUNING meter.) If it becomes necessary to make frequent, or large adjustments to the tuning controls in order to obtain a dip, accompanied by pronounced signal fading, ask for technician services.

(5) OVEN TEMPERATURE. — The INT. STD. PHASE/TEMP. switch (normally in TEMP. position) and the PHASE OR TEMP. meter, both located behind the cover plate of the upper converter deck, are used to indicate the temperature of the crystal oven, or to check the accuracy of the 1 mc crystal. A steady midscale reading should be obtained after 30 minutes of receiver operation with the switch in the TEMP. position. Report full-scale or zero reading to the technician on duty immediately.

(6) CRYSTAL ACCURACY. — The accuracy of the 1 mc crystal oscillator output should be checked daily, provided that a frequency standard with an accuracy of 1 part in 10^8 or better is available. Use the following procedure to conduct the check:

(a) Connect the output cable of the frequency standard, which has been adjusted to produce a 1 mc output, to the EXT 1 mc input jack (J952) on the converter blister at the rear of the receiver.

(b) Raise the air-filter cover on the front of the receiver to expose the upper converter deck panel, and unlock the INTERNAL STANDARD ADJUSTMENT control. Make sure that the FREQ. STAND. switch is set to INT. STD.

(c) Set and hold the INT. STD. PHASE/TEMP. switch in the PHASE position. Using a stop watch, count the number of beats indicated by deflections of the PHASE OR TEMP. meter which occur in a 10-second interval. (A beat is one full deflection and return of the meter pointer.)

(d) If the number of beats observed in 10 seconds is one or less, the crystal output is accurate to 1 part in 10^7 or better.

(e) A beat count of more than 1 indicates need for adjustment. Rotate the INTERNAL STANDARD ADJUSTMENT control very slowly, observing the rate at which beats are occurring. Adjust until the beat count is within the limit prescribed.

(f) Release the switch, record the reading of the INT. STD. LOG counter, and lock the INTERNAL STANDARD ADJUSTMENT control. Lower the filter cover and secure it.

(g) The frequency standard may be left connected if desired. Instructions for the operation of this equipment should be consulted.

(7) ANTENNA COUPLER. — Placing the ANT. CPLG. switch successively in position 1, 2, and 3 should result in a noticeable decrease in signal strength at each setting.

(8) AUTOMATIC GAIN CONTROL. — When AGC is used, the audio output level should remain fairly constant. Note and report any large variations. Also, check time-constant settings for the type of transmission being received.

(9) SILENCER CIRCUIT. — A silencer circuit is provided in the AM section to keep out background noise during voice reception. Check this operation periodically. Report the reception of background noise and other unwanted signals.

(10) OUTPUT LIMITER. — Normally used during CW and MCW reception, this control should be checked with the R.F. GAIN control set high. Report any appreciable variation from reasonably constant output.

CAUTION

Controls and switches should move easily from one setting to another. If a control or switch fails to respond to ordinary finger pressure, consider it mechanically defective and consult a technician. Do *not* attempt to force the movement of a control, either by hand or by the application of a wrench or other tool. Expensive damage is almost sure to result. The tuning controls are equipped with friction locks to prevent inadvertent changes of setting. Unlock these controls before changing their settings.

c. ROUTINE CHECK CHARTS. — The Maintenance Standards Book for Radio Receiving Sets AN/WRR-2A and AN/FRR-59A (NAVSHIPS 94715.42) provides maintenance and operating personnel with a systematic and efficient method of checking the equipment and performing routine preventive maintenance.

d. EMERGENCY MAINTENANCE. — Operating personnel must expect the possibility of failure during battle or other emergency conditions when technician services are not immediately available. If the need for keeping the receiver is paramount, the operator must be able to locate the source of the trouble, determine its nature, and make repairs. It is not practical to attempt a discussion of every type of failure which may possibly occur. Instead, a general outline of trouble-shooting techniques will be presented to aid the operator in developing a systematic approach to emergency maintenance.

(1) ISOLATING TROUBLE. — The receiver is made up of a series of interconnected functional sections, each of which is designed to perform specific tasks contributing to the operation of the set as a whole. A component failure in one of these sections will usually have an adverse effect on several associated sections, which may in turn affect still others. Depending on the function of the defective part, the result may range in gravity from reduced sensitivity or selectivity to a complete breakdown of the equipment. A haphazard search through all components in all sections is not likely to accomplish much, except by accident. A much more efficient approach involves the isolation of the section in which the trouble has occurred, followed by a detailed examination of that section with the object of pinpointing the defective components. Once these steps have been taken, the problem of repair becomes greatly simplified. Make the following checks before attempting a detailed analysis:

(a) Check the position of all controls to ensure that they have not been accidentally moved from operating position.

(b) If the set is apparently dead (no frequency counter dial illumination, no meter indications, no audio output), check primary power switches, both on the panel (POWER ON/OFF) and any external line switches. Note whether other equipment fed by the same line is affected.

(c) If the antenna is connected through a switch or distribution panel, make sure that such connections have been properly made.

(d) Make sure that all external connections to the receiver and interconnections (external) between the converter and demodulator have been made properly.

(e) Check all fuses to determine the power circuit affected by the trouble. Do not replace a fuse before making a careful examination of the circuit to make sure that no permanent defect exists.

(f) Inspect all terminal boards at the rear of the demodulator and converter drawers for broken or loose connections.

(g) Make a general inspection of all internal wiring for broken or short-circuited leads.

(h) Inspect all tubes, noting any which are not operating (metal casing cool, filament not lighted).

(2) DEFECTIVE TUBE INDICATIONS.—Several types of electron tube failures present visible evidence to a careful observer. Keep in mind, however, that many other defective tubes will reveal themselves only after having been tested with appropriate measuring instruments. A knowledge of these instruments and their uses can be gained by study of such references as Handbook of Test Methods and Practices (NAVSHIPS 91828A) and Electronic Test Equipment Application Guide (NAVSHIPS 91727). Lacking this knowledge, or when test equipment is not available, the operator must restrict his investigation to a search for visible indications of tube breakdown.

(a) Arcing across electrodes may be observed with shield removed. Tubes found in this condition should be replaced.

(b) Gassy (soft) tubes are revealed by the existence of a purplish-blue film in the area occupied by the electrodes. These also should be replaced.

(c) Tubes having warped or sagging electrodes give an audible indication of their condition. Tap the tube sharply while monitoring the appropriate audio output. Sharp bursts of noise in the headphones indicate that one or more tube elements are loose. Replace the tube with a new one.

CAUTION

> Before removing any tube from its socket, make sure that primary power has been removed from the equipment. Remove tubes by carefully pulling them straight up from their sockets. Straighten bent pins with a pin straightener before replacing them in their sockets. Be sure to replace each tube in its assigned socket.

(e) Test a tube suspected of being defective by replacing it with a new tube. At least one tested tube of each type required by the receiver should be kept readily available for this purpose. This substitution test is often not conclusive. If several tubes in a circuit are defective, replacing only one will not cure the trouble. Replacement of tubes in high-frequency tuned circuits may detune the circuit, even though the design characteristics of the new tube are the same as those of the old one. The receiver must then be realigned. The results of this test should not be used as a basis for discarding a tube. The possibility of broken electrical leads or other failure within the receiver should be explored first. Carefully inspect tubes and their sockets for dirt, corrosion, bent pins, and other visible defects before replacement. Turn over suspected tubes to a technician for complete testing before discarding them.

(3) TROUBLE-SHOOTING GUIDE.—Table 3-5 will help the operator to find and correct minor troubles. In case of a major failure, this guide will help to determine which section or circuit is at fault.

(4) TUBE AND FUSE LOCATIONS.—Illustrations in Section 5 show the locations of all tubes and fuses.

TABLE 3-5. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, TROUBLE-SHOOTING GUIDE

INDICATION	PROBABLE CAUSE	REMEDIAL ACTION
1. Receiver dead; dial lamps do not light; no meter indications.	1. *a.* POWER ON/OFF switch to OFF.	1. *a.* Check setting. Turn to ON.
	b. External power supply (ship's supply) turned off.	*b.* Check other equipment to verify. Have power restored.
	c. Primary ac power fuses F651 or F652 open.	*c.* Check fuses, located on front panel of demodulator lower deck. Inform technician if new fuses blow as soon as power is applied.
	d. Faulty external power connection.	*d.* Check primary ac power connection P1803/J1803 in demodulator blister. Tighten connector.
2. Lighted dial lamps but no meter indications, no audio outputs.	2. *a.* Faulty antenna connection.	2. *a.* Check antenna connection P957/J957 at rear of converter (see figure 5-75).
	b. Antenna coupler fuse F2801 open.	*b.* Check fuse F2801 located in holder labeled FUSE below ANT. CPLG. switch knob on lower converter panel. Replace if necessary.
	c. Defective tubes in preselector.	*c.* Check tubes V51, V101, and V151 in preselector at left rear of lower converter deck.

TABLE 3-5. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, TROUBLE-SHOOTING GUIDE (cont)

INDICATION	PROBABLE CAUSE	REMEDIAL ACTION
	d. Defective tubes in IF amplifier.	*d.* Check tubes V501 to V508, located at right rear of lower converter deck.
3. Lamps and meters operate, but receiver apparently dead; no audio output.	3. *a.* Phones or speaker defective.	3. *a.* Check by substitution of known good speaker or phones.
	b. Defect in audio output channel (line A or line B).	*b.* (1) Check output of other channel. (2) Check output connections.
	c. Defect in AF amplifier.	*c.* Check tubes V1606, V1607, V1608, and V1609, or V1007, V1008, or V1108, V1109 as appropriate, located in upper and lower demodulator decks.
4. Tuning counters set to correct frequency but tuning meter does not indicate; no signal output during incremental tuning.	4. *a.* Station not tuned in (station transmitter off frequency or defect in incremental tuning).	4. *a.* Attempt to tune in station using continuous tuning.
	b. Selectivity too narrow for type of reception.	*b.* Check R.F. SELECTIVITY BW-KCS switch for proper setting.
5. Whistling tone in receiver during A3 reception.	5. BFO activated.	5. Check B.F.O. switch. If on, turn to OFF.
6. No tone during A1 reception; only clicks heard.	6. BFO defective.	6. Check BFO V1610 and replace if tube is suspected.
7. Signal distortion during attempt to receive A9 signals.	7. Wrong detector-amplifier in use.	7. Check position of RECEPTION switch. Make sure that switch is set to S.S.B.

SECTION 4

PRINCIPLES OF OPERATION

4-1. OVER-ALL FUNCTIONAL DESCRIPTION.

a. GENERAL.—Radio Receiving Sets AN/WRR-2A and AN/FRR-59A are triple-conversion superheterodyne receivers which operate in the frequency range of 2.0 mc to 32.0 mc in four bands. These are:

(1) 2.0 mc to 4.0 mc
(2) 4.0 mc to 8.0 mc
(3) 8.0 mc to 16.0 mc
(4) 16.0 mc to 32.0 mc

The receiver's three detector-amplifier sections provide operation in the following modes:

(1) A1 - On/off keyed continuous wave (CW)
(2) A2 - On/off keyed tone-modulated continuous wave
(3) A3 - Amplitude modulation (AM)
(4) A9 - Single sideband
(5) F1 - Frequency-shift teletype
(6) F4 - Facsimile.

b. SYSTEM BLOCK DIAGRAM.—Figure 4-1 is a basic block diagram of the receiver. It shows the functional relationship between the two drawers which comprise the receiver. These are:

(1) Electronic Frequency Converter CV-920A/URR (converter)

(2) Intermediate Frequency-Audio Frequency Amplifier AM-2477A/URR (demodulator).

The converter receives a signal in the 2-32 mc range and converts it to an 80 kc intermediate frequency. It also generates an 80 kc signal for carrier reinsertion. Both signals are applied to the demodulator, the basic functions of which are IF amplification, detection, and audio-frequency amplification. Triple-frequency conversion, frequency-drift cancellation, and incremental tuning are discussed below, since these design features are not generally found in superheterodyne receivers.

c. FUNCTIONAL OPERATION.—Figure 4-2 is a block diagram showing the converter and demodulator as separate major units. The main signal path through the various assemblies is indicated by a heavy line.

(1) CONVERTER.—An RF signal from the antenna is applied to the antenna coupler, which provides three degrees of signal attenuation for optimum performance under strong signal conditions. The output of the coupler goes to the preselector, where it is amplified and applied to a mixer. Here it is combined with a locally generated RF signal from the high-frequency oscillator to produce the first IF signal at a frequency between 1,625 kc and 1,725 kc. This frequency is selected by the tunable IF filter and applied to the injection IF amplifier, which in turn produces the 80 kc signal to be applied to the demodulator. The injection IF amplifier performs intermediate-frequency amplification and two frequency conversions—the first from 1,625-1,725 kc to 220 kc and the second from 220 kc to 80 kc.

(2) DEMODULATOR.—In the demodulator the 80 kc filter receives the signal and distributes it to the amplitude-modulated (AM) and upper-sideband (USB) detector-amplifiers. The latter supplies the 80 kc signal to the lower-sideband (LSB) detector-amplifier.

(*a*) AM DETECTOR-AMPLIFIER.—In the AM detector-amplifier the 80 kc signal is amplified and

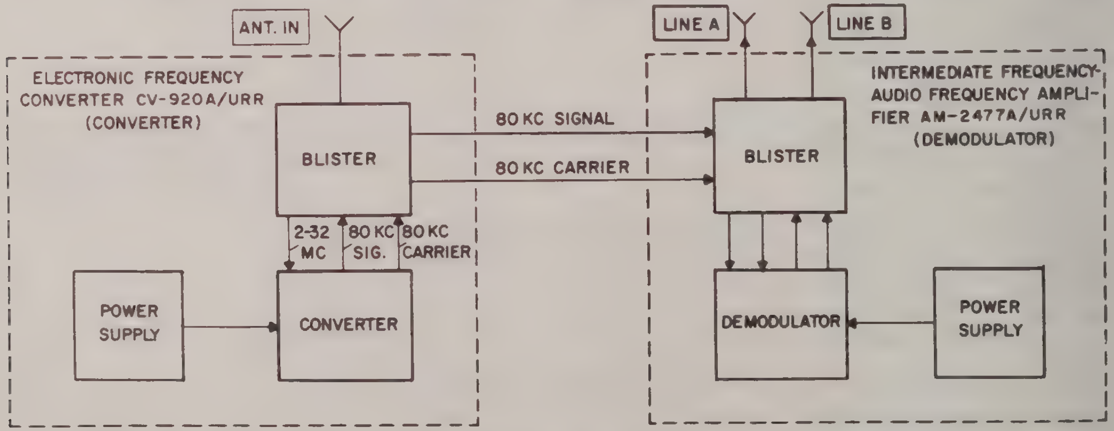


Figure 4-1. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Basic Block Diagram

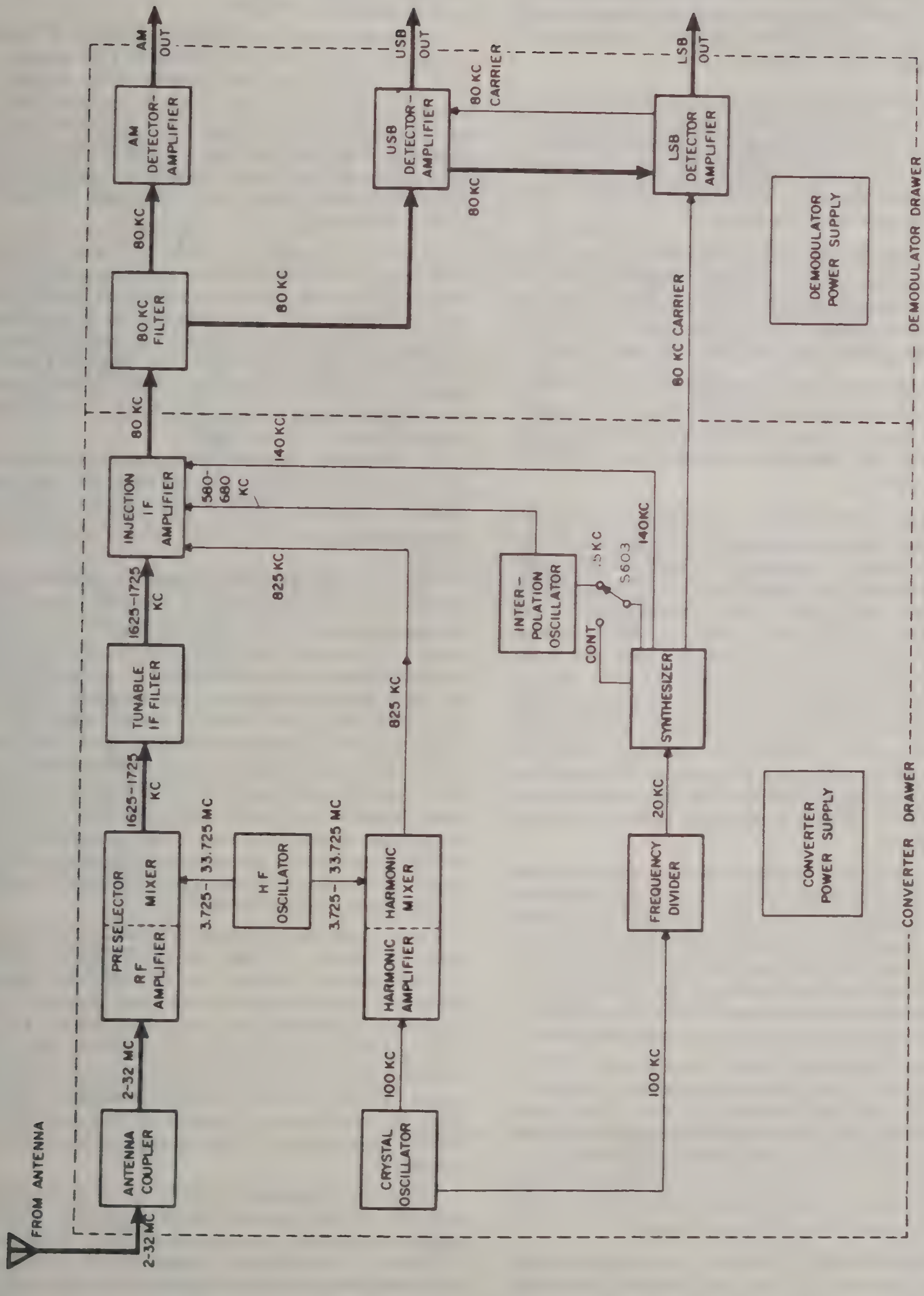

FROM ANTENNA
2-32 MC
ANTENNA COUPLER
2-32 MC
PRESELECTOR
RF AMPLIFIER
MIXER
1625-1725 KC
TUNABLE IF FILTER
1625-1725 KC
INJECTION IF AMPLIFIER
80 KC
80 KC FILTER
80 KC
AM DETECTOR-AMPLIFIER
AM OUT
80 KC
USB DETECTOR-AMPLIFIER
USB OUT
80 KC CARRIER
80 KC
LSB DETECTOR AMPLIFIER
LSB OUT
DEMODULATOR POWER SUPPLY
DEMODULATOR DRAWER
140 KC
580-680 KC
825 KC
3.725-33.725 MC
HF OSCILLATOR
3.725-33.725 MC
HARMONIC AMPLIFIER
HARMONIC MIXER
825 KC
100 KC
CRYSTAL OSCILLATOR
100 KC
FREQUENCY DIVIDER
20 KC
SYNTHESIZER
140 KC
80 KC CARRIER
INTER-POLATION OSCILLATOR
.5 KC
S603
CONT
CONVERTER POWER SUPPLY
CONVERTER DRAWER

Figure 4-2. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Functional Block Diagram

detected. Several stages of audio amplification follow. A beat-frequency oscillator (BFO) is also included for reception of CW signals. Audio limiting, silencing, and automatic gain control (AGC) circuits are also included but are not shown in figure 4-2.

(*b*) USB DETECTOR-AMPLIFIER.—In the USB detector-amplifier the 80 kc signal is amplified and applied to a ring-type demodulator where it is mixed with an 80 kc carrier to produce an audio output. A two-stage audio amplifier, and an AGC circuit are also included but not shown in figure 4-2.

(*c*) LSB DETECTOR-AMPLIFIER.—In the LSB detector-amplifier the 80 kc signal is amplified and also applied to a ring-type demodulator, similar to that in the USB. A two-stage audio amplifier, and an AGC circuit are also included but not shown in figure 4-2.

d. DETAILED BLOCK DIAGRAM.—Figure 4-3 is a detailed block diagram of the receiver, showing each functional stage of operation and its relationship with other stages. The functional assemblies are identified by dashed lines.

e. TRIPLE FREQUENCY CONVERSION.—Figure 4-4 is a block diagram showing the development of the three intermediate frequencies. The preselector RF amplifiers select an operating frequency between 2.0 mc and 32.0 mc and apply it, after amplification, to the first conversion mixer. In the mixer the first injection frequency of 3.725 mc to 33.725 mc, from the high-frequency (HF) oscillator, is combined with the incoming signal to produce the first IF frequency, which is applied to the 1,625-1,725 kc tunable IF filter. The preselector and the HF oscillator are tuned jointly in 100 kc steps, or increments. The tunable IF filter scans these steps and selects the first IF frequency. An explanation of the tuning procedure is given in subparagraph *f* below.

The output of the tunable IF filter is applied to the second conversion mixer, which receives also the second injection frequency of 1,405 kc to 1,505 kc. This second injection frequency is supplied either in 0.5 kc steps or variably from 1,405 kc to 1,505 kc for continuous tuning. The heterodyning action of the second conversion mixer produces the second IF of 220 kc, which is amplified and applied to the third conversion mixer.

The third conversion mixer combines the 220 kc signal with the third injection frequency of 140 kc to produce the third IF frequency of 80 kc. For incremental tuning, the 140 kc injection frequency is obtained from the output of the interpolation oscillator combined with 0.5 kc harmonic frequencies; for continuous tuning it comes directly from the harmonic generator (located in synthesizer section).

f. INCREMENTAL TUNING.—Incremental tuning is provided in steps of 0.5 kc over the entire operating range of the receiver—2.0 mc to 32.0 mc. Continuous tuning is also available in this range at slightly lower frequency stability. Figure 4-5 is a basic tuning diagram of the receiver in the incremental mode, tuned, as an example, to 2.105 mc.

In this example, the TUNING ΔF=100 KC panel control is set to cause the MEGACYCLE counter to read 02.1. This tunes the preselector to receive all signals in the 100 kc range from 2.- mc to 2.2 mc, as signals in the 100 kc range from 2.1 to 2.2 mc, as shown in detail A of the diagram. The relative position of 2.105 mc in this range is shown in a dash-line box. Other RF signals in the 2.1-2.2 mc range will also be present at this stage.

The tuning capacitor of the HF oscillator is ganged with that of the preselector; therefore, setting the MEGACYCLE counter to 02.1 also tunes the HF oscillator (V301) to 3.825 mc, providing the first injection frequency. This signal beats with the selected 2.105 mc in the preselector mixer (V151) to produce a first IF signal of 1,720 kc (3.825 mc—2.105 mc=1,720 kc). The 3.825 mc signal will mix also with any other signals present in the 2.1-2.2 mc range.

The TUNING (KILOCYCLE) control is set to cause the KILOCYCLE counter to read 05.0. This tunes the tunable IF filter to 1,720 kc. The filter also rejects all other signals present in the 2.1-2.2 mc range (see detail B).

When the HF oscillator supplies its 3.825 mc signal to the first mixer it supplies an identical signal to the harmonic mixer (V251). Here the signal is combined with a 3.0 mc pip selected by the tunable harmonic amplifier from the 100 kc frequency spectrum developed by the frequency divider and the harmonic amplifier. The TUNING ΔF=100 KC control tunes the harmonic amplifier, automatically selecting the pip. Combining the 3.825 mc signal from the HF oscillator with the 3.0 mc pip produces an 825 kc difference frequency, which is applied to the first injection amplifier, which is fix-tuned at this frequency. After amplification the 825 kc is applied to the first injection mixer (V506), where it is combined with a 675 kc signal from the interpolation oscillator (V401).

The interpolation oscillator is tuned, simultaneously with the tunable IF filter, by the TUNING (KILOCYCLE) control. When the KILOCYCLE counter reads 05.0, the interpolation oscillator provides a 675 kc signal. Combining this signal with the 825 kc provides a 1,500 kc signal which is applied to the second injection amplifier and thence to the second conversion mixer (V502). Here the 1,500 kc is combined with the 1,720 kc signal from the tunable IF filter, and the difference frequency of 220 kc is applied to the 220 kc amplifier.

When the interpolation oscillator sends its 675 kc signal to the first injection mixer, it sends an identical signal to the second injection mixer (V806) through the TUNING .5 KC/CONT. switch (S603). The second injection mixer heterodynes the 675 kc with an 815 kc pip from the 1 kc spectrum (see detail E) to produce a 140 kc signal for application to the third injection

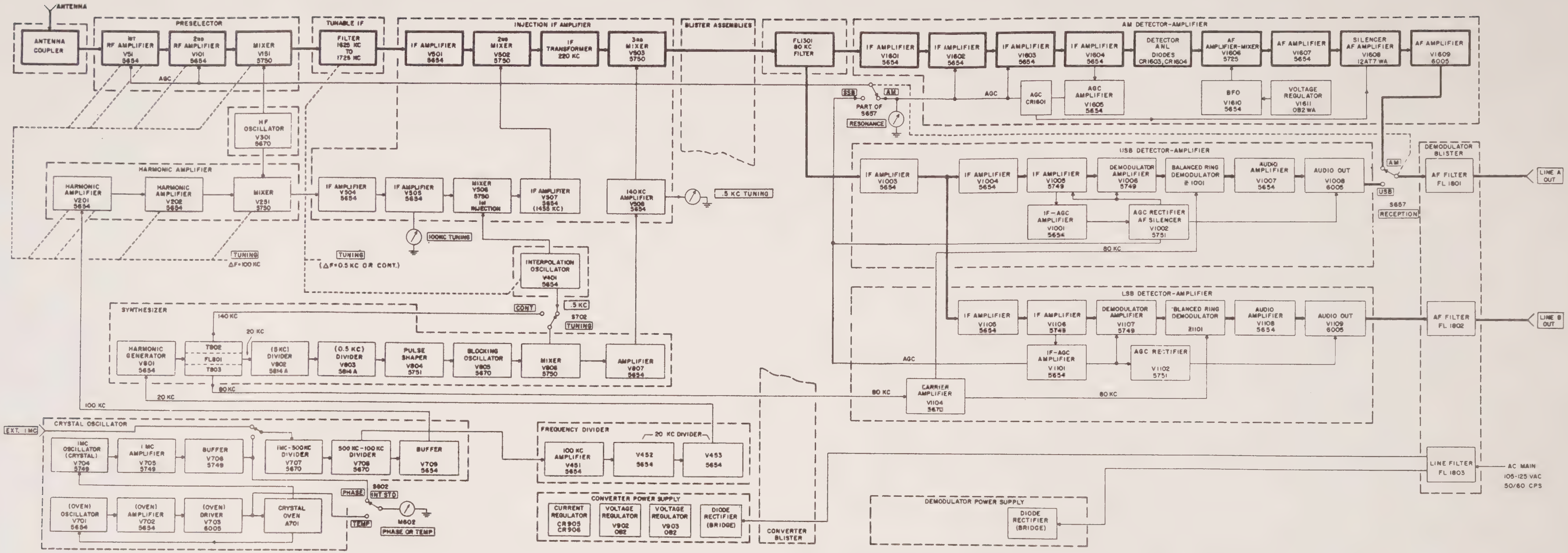
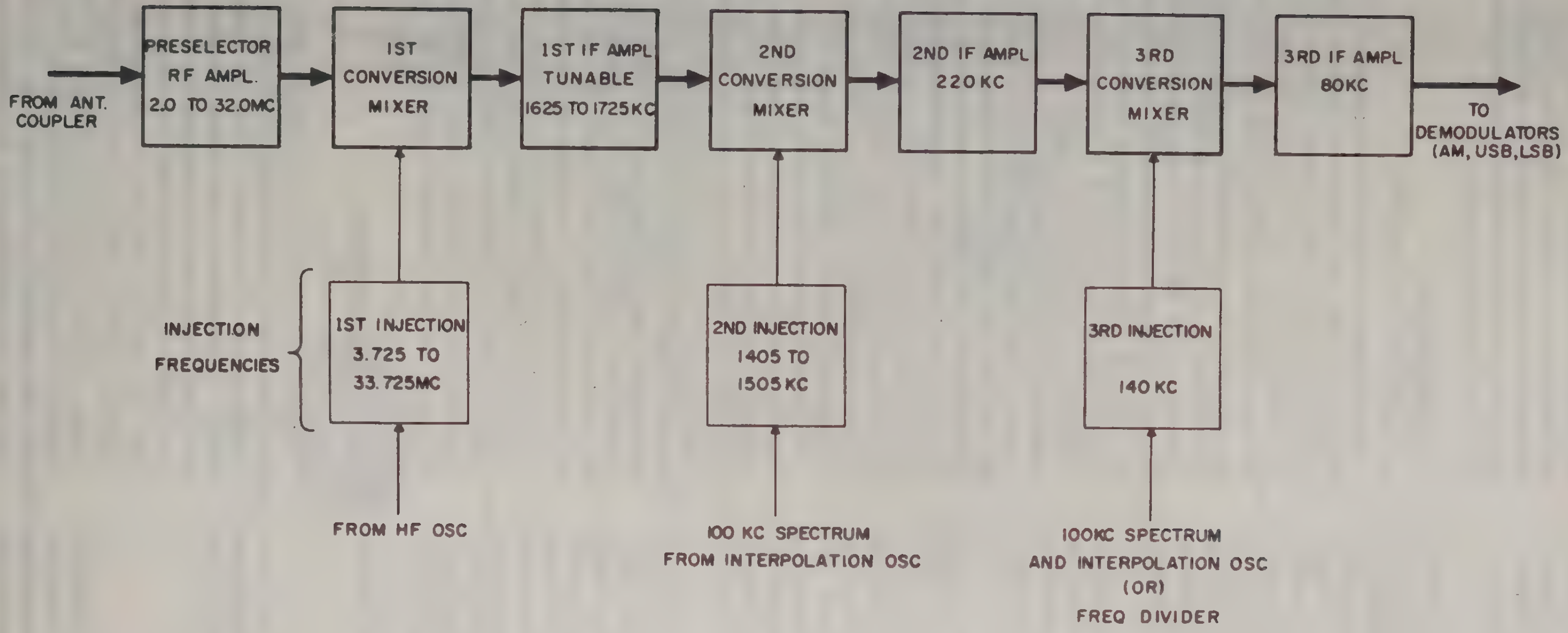

ANTENNA
ANTENNA COUPLER
PRESELECTOR
1ST RF AMPLIFIER V51 5654
2ND RF AMPLIFIER V101 5654
MIXER V151 5750
AGC
TUNABLE IF
FILTER 1625 KC TO 1725 KC
INJECTION IF AMPLIFIER
IF AMPLIFIER V501 5654
2ND MIXER V502 5750
IF TRANSFORMER 220 KC
3RD MIXER V503 5750
BLISTER ASSEMBLIES
FL1301 80 KC FILTER
AM DETECTOR-AMPLIFIER
IF AMPLIFIER V1601 5654
IF AMPLIFIER V1602 5654
IF AMPLIFIER V1603 5654
IF AMPLIFIER V1604 5654
DETECTOR ANL DIODES CR1603, CR1604
AF AMPLIFIER-MIXER V1606 5725
AF AMPLIFIER V1607 5654
SILENCER AF AMPLIFIER V1608 12AT7 WA
AF AMPLIFIER V1609 6005
SSB
AM
PART OF S657
RESONANCE
AGC
AGC CR1601
AGC AMPLIFIER V1605 5654
BFO V1610 5654
VOLTAGE REGULATOR V1611 OB2 WA
HF OSCILLATOR V301 5670
HARMONIC AMPLIFIER
HARMONIC AMPLIFIER V201 5654
HARMONIC AMPLIFIER V202 5654
MIXER V251 5750
TUNING
ΔF=100 KC
IF AMPLIFIER V504 5654
IF AMPLIFIER V505 5654
MIXER V506 5750 1st INJECTION
IF AMPLIFIER V507 5654 (1455 KC)
100KC TUNING
TUNING
(ΔF=0.5 KC OR CONT.)
140 KC AMPLIFIER V508 5654
.5 KC TUNING
INTERPOLATION OSCILLATOR V401 5654
CONT
.5 KC
S702
TUNING
USB DETECTOR-AMPLIFIER
IF AMPLIFIER V1003 5654
IF AMPLIFIER V1004 5654
IF AMPLIFIER V1005 5749
DEMODULATOR AMPLIFIER V1006 5749
BALANCED RING DEMODULATOR Z 1001
AUDIO AMPLIFIER V1007 5654
AUDIO OUT V1008 6005
IF-AGC AMPLIFIER V1001 5654
AGC RECTIFIER AF SILENCER V1002 5751
80 KC
AM
USB
S657
RECEPTION
DEMODULATOR BLISTER
AF FILTER FL 1801
LINE A OUT
SYNTHESIZER
140 KC
20 KC
HARMONIC GENERATOR V801 5654
T802 FL801 T803
(5KC) DIVIDER V802 5814 A
(0.5 KC) DIVIDER V803 5814 A
PULSE SHAPER V804 5751
BLOCKING OSCILLATOR V805 5670
MIXER V806 5750
AMPLIFIER V807 5654
80 KC
20 KC
100 KC
LSB DETECTOR-AMPLIFIER
IF AMPLIFIER V1105 5654
IF AMPLIFIER V1106 5749
DEMODULATOR AMPLIFIER V1107 5749
BLANCED RING DEMODULATOR Z1101
AUDIO AMPLIFIER V1108 5654
AUDIO OUT V1109 6005
AF FILTER FL 1802
LINE B OUT
AGC
IF-AGC AMPLIFIER V1101 5654
AGC RECTIFIER V1102 5751
80 KC
CARRIER AMPLIFIER V1104 5670
80 KC
EXT. 1MC
CRYSTAL OSCILLATOR
1MC OSCILLATOR (CRYSTAL) V704 5749
1 MC AMPLIFIER V705 5749
BUFFER V706 5749
1MC-500KC DIVIDER V707 5670
500 KC-100 KC DIVIDER V708 5670
BUFFER V709 5654
(OVEN) OSCILLATOR V701 5654
(OVEN) AMPLIFIER V702 5654
(OVEN) DRIVER V703 6005
CRYSTAL OVEN A701
PHASE
S602
INT STD
TEMP
M602
PHASE OR TEMP
FREQUENCY DIVIDER
20 KC DIVIDER
100 KC AMPLIFIER V451 5654
V452 5654
V453 5654
CONVERTER POWER SUPPLY
CURRENT REGULATOR CR905 CR906
VOLTAGE REGULATOR V902 OB2
VOLTAGE REGULATOR V903 OB2
DIODE RECTIFIER (BRIDGE)
CONVERTER BLISTER
LINE FILTER FL 1803
AC MAIN 105-125 VAC 50/60 CPS
DEMODULATOR POWER SUPPLY
DIODE RECTIFIER (BRIDGE)

Figure 4–3. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Detailed Block Diagram


FROM ANT. COUPLER
PRESELECTOR
RF AMPL.
2.0 TO 32.0MC
1ST
CONVERSION
MIXER
1ST IF AMPL
TUNABLE
1625 TO 1725 KC
2ND
CONVERSION
MIXER
2ND IF AMPL
220 KC
3RD
CONVERSION
MIXER
3RD IF AMPL
80KC
TO
DEMODULATORS
(AM, USB, LSB)
INJECTION
FREQUENCIES
1ST INJECTION
3.725 TO
33.725MC
2ND INJECTION
1405 TO
1505 KC
3RD INJECTION
140 KC
FROM HF OSC
100 KC SPECTRUM
FROM INTERPOLATION OSC
100KC SPECTRUM
AND INTERPOLATION OSC
(OR)
FREQ DIVIDER

CIRCUIT	FREQUENCY RANGE	TUNING
PRESELECTOR	2.0 TO 32.0 MC	CONT.(100 KC BANDWIDTH)
1ST INJECTION SIGNAL	3.725 TO 33.725MC	CONT.(USED IN 100KC STEPS)
1ST IF AMPLIFIER	1625 TO 1725 KC	CONT. (OR 0.5 KC SWEEPS)
2ND INJECTION SIGNAL	1405 TO 1505 KC	FIXED (100KC BANDWIDTH)
2ND IF AMPLIFIER	220 KC	FIXED (12 KC BANDWIDTH)
3RD INJECTION SIGNAL	140 KC	FIXED (CONT. OR 0.5 KC STEPS)
3RD IF AMPLIFIER	80 KC	FIXED (12 KC BANDWIDTH)

Figure 4-4. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Frequency Conversion Diagram

amplifier and thence to the third mixer (V503), where combination with the 220 kc from the second mixer and amplifier produces the third IF signal of 80 kc. This is the signal that is applied to the three detector-amplifiers in the demodulator.

g. CONTINUOUS TUNING.—Placing the TUNING .5 KC/CONT. switch in the CONT. position supplies a 140 kc signal from the harmonic generator to the second injection mixer. The 0.5 kc blocking oscillator does not function with the TUNING .5 KC/CONT. switch set to CONT. The interpolation oscillator now provides continuous tuning in each 100 kc segment established by the receiver front end. The output of the interpolation oscillator is not frequency-drift-canceled during continuous tuning, and receiver stability in this mode is subject to interpolation-oscillator frequency-drift.

h. FREQUENCY-DRIFT CANCELLATION.—The receiver has two frequency-drift canceling circuits, one for the output of the HF oscillator, the other, used only in incremental tuning, for that of the interpolation oscillator.

(1) HF OSCILLATOR.—This drift-canceling circuit stabilizes the 220 kc output of the second mixer (V502) by compensating for changes in the HF oscillator frequency. As shown in figure 4-5, the second mixer receives two input signals—one (1,720 kc) from the tunable IF filter, the other (1,500 kc) from the second injection amplifier. Both are derived from the 3.825 mc output of the HF oscillator. A change of frequency in the HF oscillator output will affect, inversely by equal amounts, both inputs to the second mixer, thereby eliminating all effects of drift.

(2) INTERPOLATION OSCILLATOR.—The second drift-canceling circuit stabilizes the 80 kc output of the third mixer (V503) by compensating for changes in the output of the interpolation oscillator. As with the other circuit, the third mixer receives two input frequencies—220 kc from the 220 kc IF amplifier and 140 kc from the third injection amplifier, both derived from the 675 kc output of the interpolation oscillator. Any variation in the 675 kc output affects both inputs at V503 inversely in equal amounts, canceling the drift effect.

A more detailed discussion of frequency-drift cancellation circuits is given in paragraph 4-6*b*.

4-2. FUNCTIONAL SECTIONS.

In figure 4-3, the detailed block diagram of the receiver, the functional assemblies are identified by dashed lines. The detailed theory of these assemblies is given in the following paragraphs.

4-3. ANTENNA COUPLER

(See figure 4-6.)

The antenna coupler attenuates high-level signals to prevent distortion from cross-modulation. It also contains a fuse to protect input circuits from damage from extremely high antenna currents. Switch positions 1, 2, and 3 provide attenuations of -20 db, -40 db, and -45 db, respectively. A fourth position, labeled NOR., provides the fuse protection but no attenuation. If the fuse blows, the signal path can be restored instantly via one of the other switch positions.

4-4. PRESELECTOR.

(See figures 4-7 and 4-8.)

The preselector consists of two stages of RF amplification and the first conversion mixer. Figure 4-7 shows the RF amplifiers operating in band 1 position. (For simplicity, the band switch is not shown. An X indicates where the switching of the band coils occurs.) An RF signal from the antenna coupler is applied to input connector J51 of the preselector. A tank circuit, consisting of RF coil L51, tuning capacitor C601A, antenna compensating (ANT COMP) capacitor C51, and RF coil L58, selects the desired operating frequency. Variable capacitor C601A is a panel control labeled TUNING △F=100 KC. The signal is coupled to the control grid of first RF amplifier V51 through coupling capacitor C59. The output of V51 is developed across RF coil L101 and applied to the control grid of second RF amplifier V101 through coupling capacitor C107. The output of V101 is developed across RF coil L151 and applied to the preselector (first conversion) mixer. AGC voltage developed in the detector-amplifier section of the demodulator is applied to the first and second RF amplifiers through resistors R52 and R102.

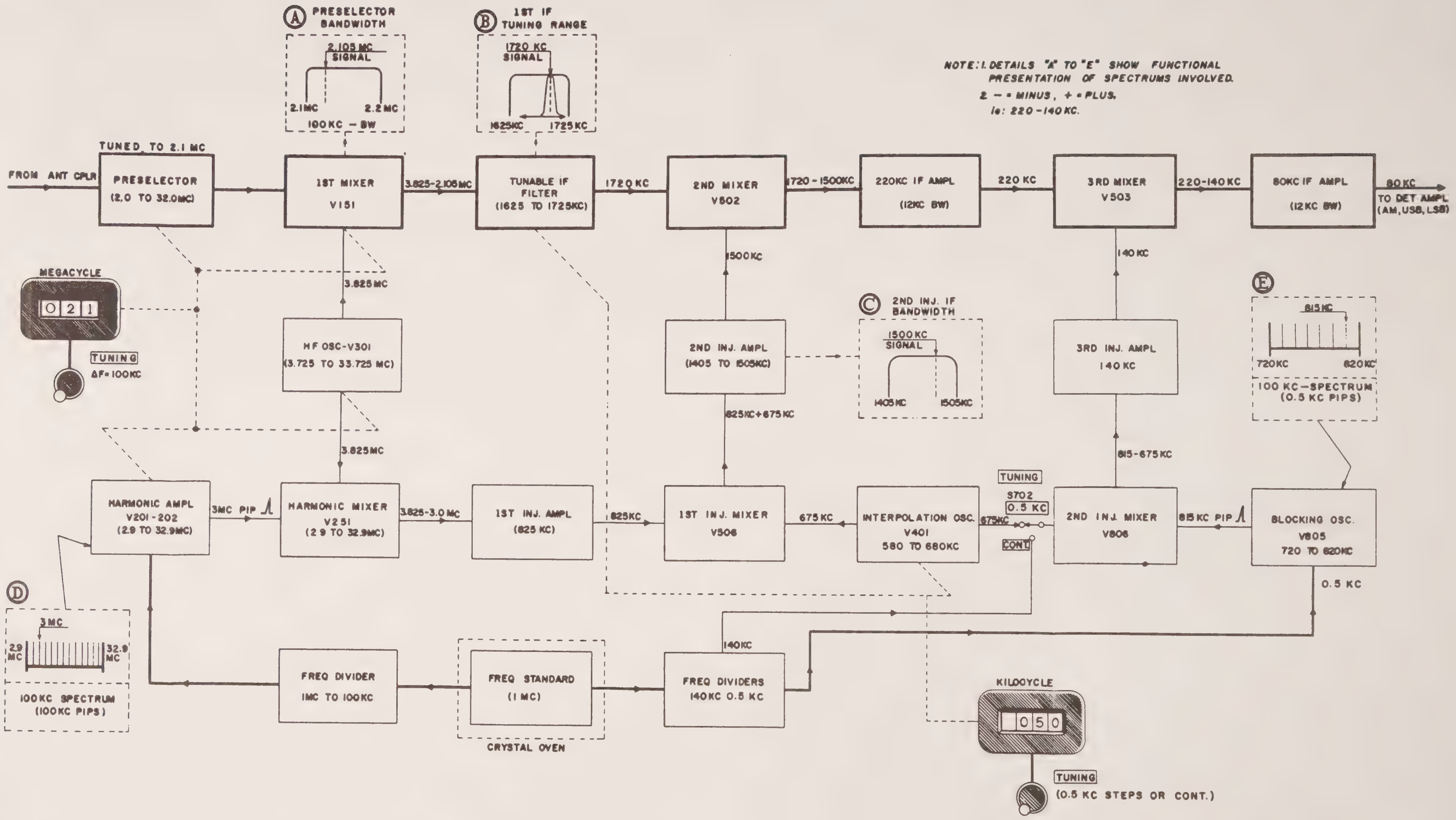
RF GAIN control R607 is a dual-section control which adjusts the gain of the first and second RF amplifers, IF amplifers V1602 and V1603 in the AM unit, and V1003 in the USB unit. Section R607A has a reverse log taper for gradual adjustment of gain in the first RF amplifier and for minimizing cross-modulation of this stage by strong signals. R607B has a linear response and changes the gain of the second RF amplifier V101 and IF amplifiers V1602, V1603, and V1003 in direct proportion to the gain-control rotation.

In figure 4-8, preselector mixer V151 receives signals from the HF oscillator at J153 and from the second RF amplifier at J151. Mixer V151 heterodynes these inputs to produce the first IF signal (1625 to 1725 kc) across RF coil L351. This inductor is part of the tunable IF filter.

4-5. TUNABLE IF FILTER.

(See figure 4-9.)

The tunable IF filter is a continually tuned four-section filter which follows the preselector mixer. Actually the first section of the tunable IF filter contains the plate load of the preselector mixer stage; therefore, the output signal of the mixer is developed in this section of the tunable IF filter. The four filter sections are tuned from 1,625 kc to 1,725 kc by a four-section variable capacitor (C351). This capacitor is ganged to the tuning capacitor of the interpolation oscillator and tunable IF filter by the TUNING (KILOCYCLE) control. The tunable IF filter selects the first conversion frequency from the output of the preselector mixer.


Ⓐ PRESELECTOR BANDWIDTH
2.105 MC SIGNAL
2.1MC
2.2MC
100KC – BW
Ⓑ 1ST IF TUNING RANGE
1720 KC SIGNAL
1625KC
1725KC
FROM ANT CPLR
TUNED TO 2.1 MC
PRESELECTOR (2.0 TO 32.0MC)
1ST MIXER V151
3.825-2.105MC
TUNABLE IF FILTER (1625 TO 1725KC)
1720 KC
2ND MIXER V502
1720 - 1500KC
220KC IF AMPL (12KC BW)
220 KC
3RD MIXER V503
220-140KC
80KC IF AMPL (12KC BW)
80KC
TO DET AMPL (AM, USB, LSB)
MEGACYCLE
021
TUNING
ΔF= 100KC
3.825MC
HF OSC-V301 (3.725 TO 33.725 MC)
3.825MC
1500KC
2ND INJ. AMPL (1405 TO 1505KC)
Ⓒ 2ND INJ. IF BANDWIDTH
1500KC SIGNAL
1405KC
1505KC
825KC+675KC
140KC
3RD INJ. AMPL 140 KC
815-675KC
Ⓔ
815KC
720KC
820KC
100 KC—SPECTRUM (0.5 KC PIPS)
HARMONIC AMPL V201-202 (2.9 TO 32.9MC)
3MC PIP
HARMONIC MIXER V251 (2.9 TO 32.9MC)
3.825-3.0MC
1ST INJ. AMPL (825 KC)
825KC
1ST INJ. MIXER V506
675KC
INTERPOLATION OSC. V401 580 TO 680KC
675KC
TUNING
S702
0.5 KC
CONT
2ND INJ. MIXER V806
815KC PIP
BLOCKING OSC. V805 720 TO 820KC
0.5 KC
Ⓓ
3MC
2.9 MC
32.9 MC
100KC SPECTRUM (100KC PIPS)
FREQ DIVIDER 1MC TO 100KC
FREQ STANDARD (1 MC)
CRYSTAL OVEN
140KC
FREQ DIVIDERS 140KC 0.5 KC
KILOCYCLE
050
TUNING
(0.5 KC STEPS OR CONT.)

NOTE: 1. DETAILS "A" TO "E" SHOW FUNCTIONAL PRESENTATION OF SPECTRUMS INVOLVED.
2. – = MINUS, + = PLUS.
ie: 220 - 140 KC.

Figure 4—5. Radio Receiving Sets AN/WRR-2A and AN/FRR-59A, Basic Tuning Diagram

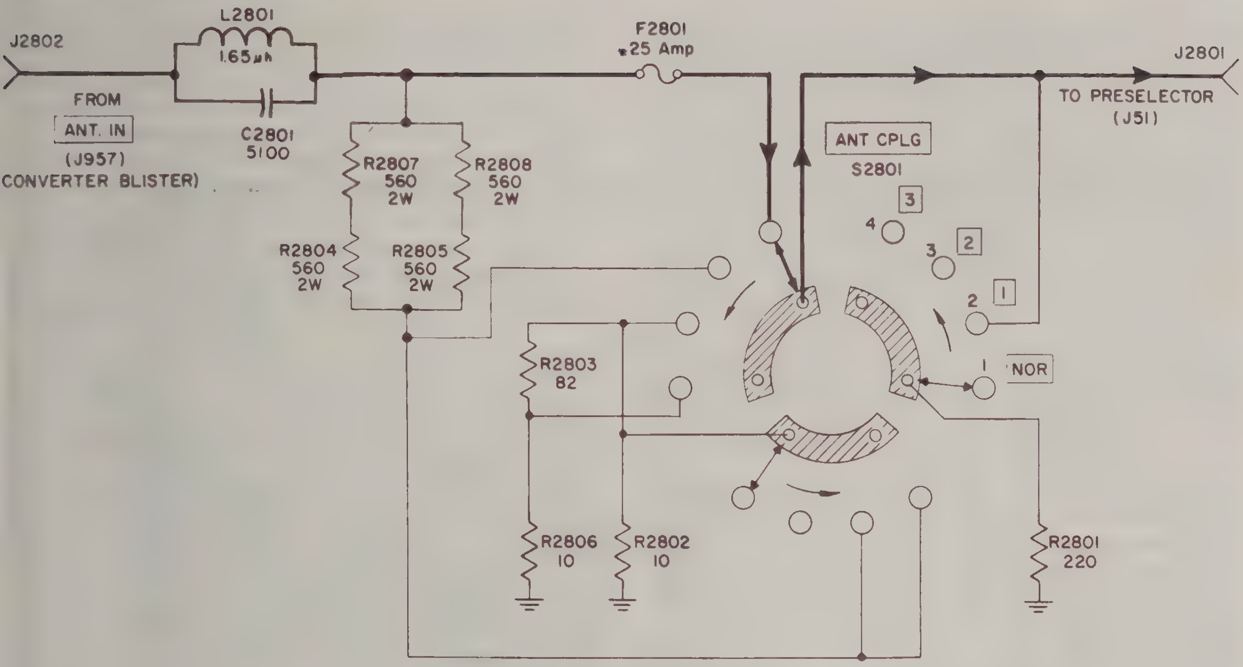
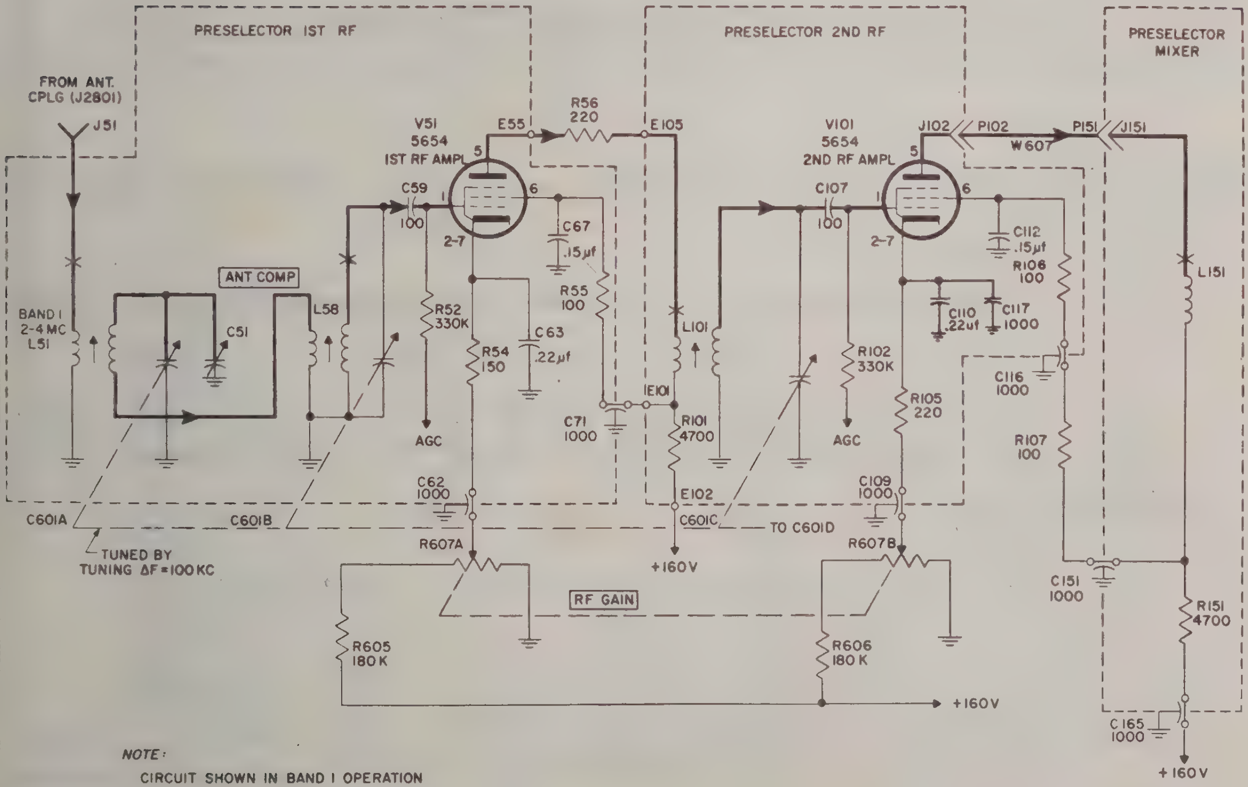

J2802
L2801
1.65μh
F2801
*.25 Amp
J2801
FROM
ANT. IN
(J957)
CONVERTER BLISTER)
C2801
5100
TO PRESELECTOR
(J51)
ANT CPLG
S2801
R2807
560
2W
R2808
560
2W
R2804
560
2W
R2805
560
2W
4
3
3
2
2
1
1
NOR
R2803
82
R2806
10
R2802
10
R2801
220

Figure 4-6. Antenna Coupler, Simplified Schematic Diagram


PRESELECTOR 1ST RF
PRESELECTOR 2ND RF
PRESELECTOR MIXER
FROM ANT. CPLG (J2801)
J51
V51
5654
1ST RF AMPL
E55
R56
220
E105
V101
5654
2ND RF AMPL
J102
P102
W607
P151
J151
C59
100
5
1
6
2-7
C67
.15μf
C107
100
C112
.15μf
R106
100
L151
ANT COMP
BAND I
2-4 MC
L51
C51
L58
R52
330K
R55
100
R54
150
C63
.22μf
L101
E101
C71
1000
R101
4700
R102
330K
C110
.22uf
C117
1000
C116
1000
R105
220
R107
100
AGC
AGC
C62
1000
E102
C109
1000
C601A
C601B
C601C
TO C601D
TUNED BY
TUNING ΔF=100KC
R607A
+160V
R607B
C151
1000
RF GAIN
R605
180 K
R606
180 K
R151
4700
+160V
C165
1000
+160V

NOTE:

CIRCUIT SHOWN IN BAND I OPERATION

✱ =BAND SWITCH CONTACTS ON S51, S52, S101, AND S151-1

Figure 4-7. Preselector RF Amplifier, Simplified Schematic Diagram

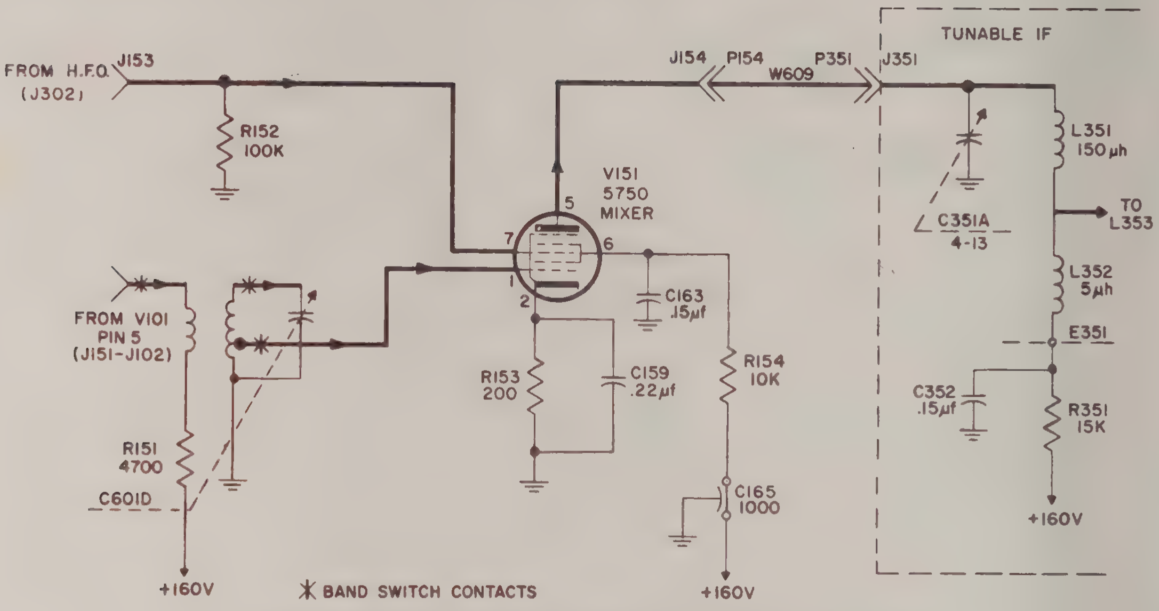

TUNABLE IF
FROM H.F.O.
(J302)
J153
R152
100K
J154
P154
W609
P351
J351
L351
150 µh
TO
L353
C351A
4-13
L352
5µh
E351
C352
.15µf
R351
15K
+160V
V151
5750
MIXER
5
7
6
1
2
C163
.15µf
R154
10K
C159
.22µf
R153
200
C165
1000
FROM V101
PIN 5
(J151-J102)
R151
4700
C601D
+160V
BAND SWITCH CONTACTS
+160V

Figure 4-8. Preselector Mixer, Simplified Schematic Diagram

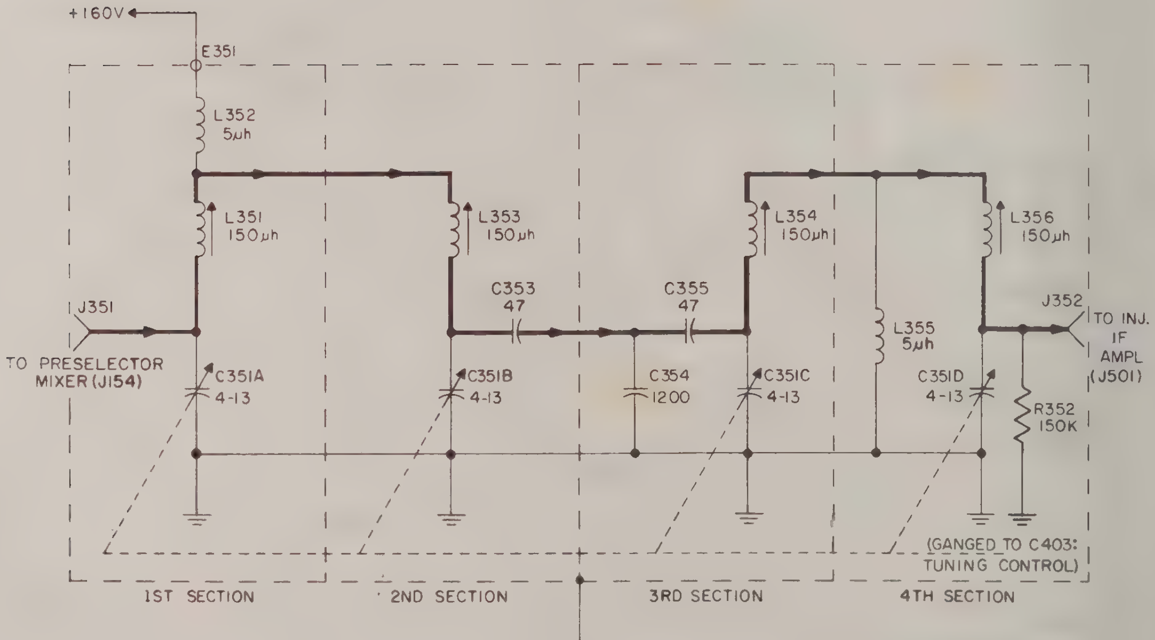

+160V
E351
L352
5µh
L351
150µh
L353
150µh
L354
150µh
L356
150µh
C353
47
C355
47
J351
TO PRESELECTOR
MIXER (J154)
C351A
4-13
C351B
4-13
C354
1200
C351C
4-13
L355
5µh
C351D
4-13
J352
TO INJ.
IF
AMPL
(J501)
R352
150K
(GANGED TO C403:
TUNING CONTROL)
1ST SECTION
2ND SECTION
3RD SECTION
4TH SECTION

Figure 4-9. Tunable IF Filter, Simplified Schematic Diagram

Figure 4-9 shows the arrangement of the resonant circuits of the filter. Each filter section has a parallel-resonant circuit.

Inductance L351, L352, and capacitor C351A serve as the plate load for mixer V151. When capacitor C351A tunes L351 to signal resonance, the common signal current passes through RF coil L352. The second section is tuned to resonance by capacitor C351B. The signal voltage across C351B is maximum at resonance and is applied to the third filter section through the capacitive divider formed by capacitors C353, C354, and C355.

Capacitor C353 is the first series divider arm and C354 the shunt arm. C353 has about 25 times the capacitive reactance of C354 at the signal frequencies, and the signal divides proportionally. The remaining series arm, C355, provides a similar signal attenuation, thereby reducing the signal applied to capacitor C351C in the third filter section by a total factor of 30. Capacitor C351C tunes RF coil L354, and common coupling coil L355 to resonance, the signal current is coupled to resonant circuit C351D and L356 in the fourth filter section. The output signal at connector J352 is developed across C351D. Inductor L355 provides a termination impedance between the third and fourth filter sections.

4-6. INJECTION IF AMPLIFIER

(See figure 4-10.)

a. GENERAL.—The injection IF amplifier section develops the converter's final intermediate frequency (80 kc) from the outputs of the tunable IF filter (1,625 kc to 1,725 kc), the interpolation oscillator (580 kc to 680 kc), the harmonic mixer (825 kc), and the synthesizer (140 kc). As shown in figure 4-10, the output from the tunable IF filter is amplified by IF amplifier V501 and applied to mixer V502, which receives also a signal of 1,405 kc to 1,505 kc from IF amplifier V507. (This second signal is derived from the addition, in mixer V506, of a signal in the range of 580 kc to 680 kc from the interpolation oscillator and 825 kc from the synthesizer.) The 220 kc output of V502 is applied to mixer V503, where it is mixed with the 140 kc signal from the synthesizer and amplifier V508. Two AGC circuits in the injection IF amplifier regulate the signal voltages in their loops. One controls the output of V505, the other the output of V508.

b. FREQUENCY-DRIFT CANCELLATION.—The injection IF amplifier also includes circuits which contribute to the operation of frequency-drift-cancellation loops, as explained in paragraph 4-1*b*. If the output from a local oscillator is injected into each of two separate mixer stages, the difference frequencies in the respective mixer outputs (based on the difference between the local oscillator frequency and the frequency of the signal input to the mixer) will both be increased by an amount equal to the drift in the local oscillator frequency. If both mixer outputs are then injected into a third mixer stage, the combining action of the latter serves to eliminate the effect of the frequency drift. The difference in frequency between two signals remains the

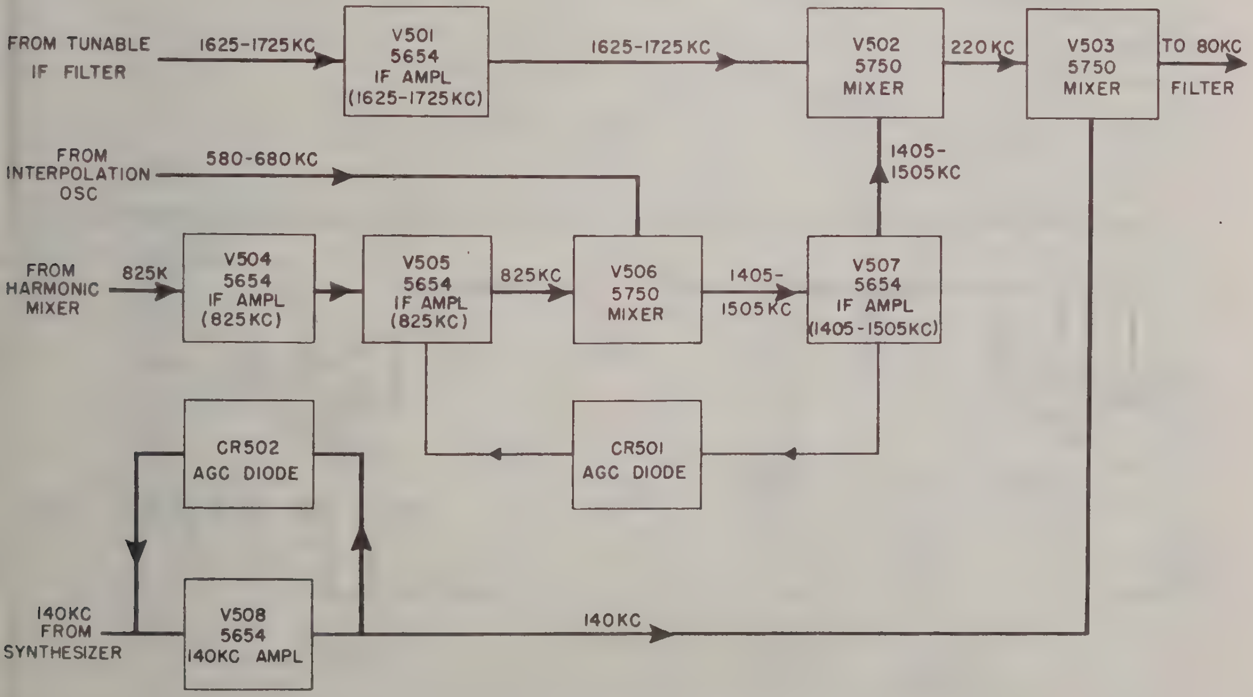

FROM TUNABLE IF FILTER
1625-1725KC
V501 5654 IF AMPL (1625-1725KC)
1625-1725KC
V502 5750 MIXER
220KC
V503 5750 MIXER
TO 80KC FILTER
FROM INTERPOLATION OSC
580-680KC
1405-1505KC
FROM HARMONIC MIXER
825K
V504 5654 IF AMPL (825KC)
V505 5654 IF AMPL (825KC)
825KC
V506 5750 MIXER
1405-1505KC
V507 5654 IF AMPL (1405-1505KC)
CR502 AGC DIODE
CR501 AGC DIODE
140KC FROM SYNTHESIZER
V508 5654 140KC AMPL
140KC

Figure 4-10. Injection IF Amplifier, Block Diagram

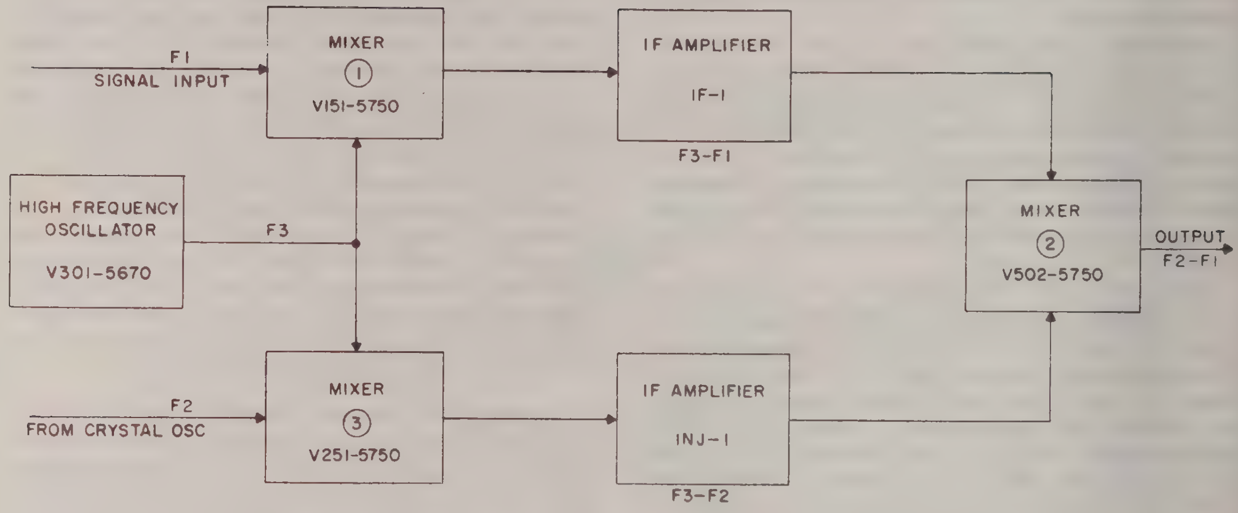

F1
SIGNAL INPUT
MIXER
①
V151-5750
IF AMPLIFIER
IF-1
F3-F1
HIGH FREQUENCY OSCILLATOR
V301-5670
F3
MIXER
②
V502-5750
OUTPUT
F2-F1
F2
FROM CRYSTAL OSC
MIXER
③
V251-5750
IF AMPLIFIER
INJ-1
F3-F2

Figure 4-11. Basic Frequency-Drift-Canceling Loop, Block Diagram

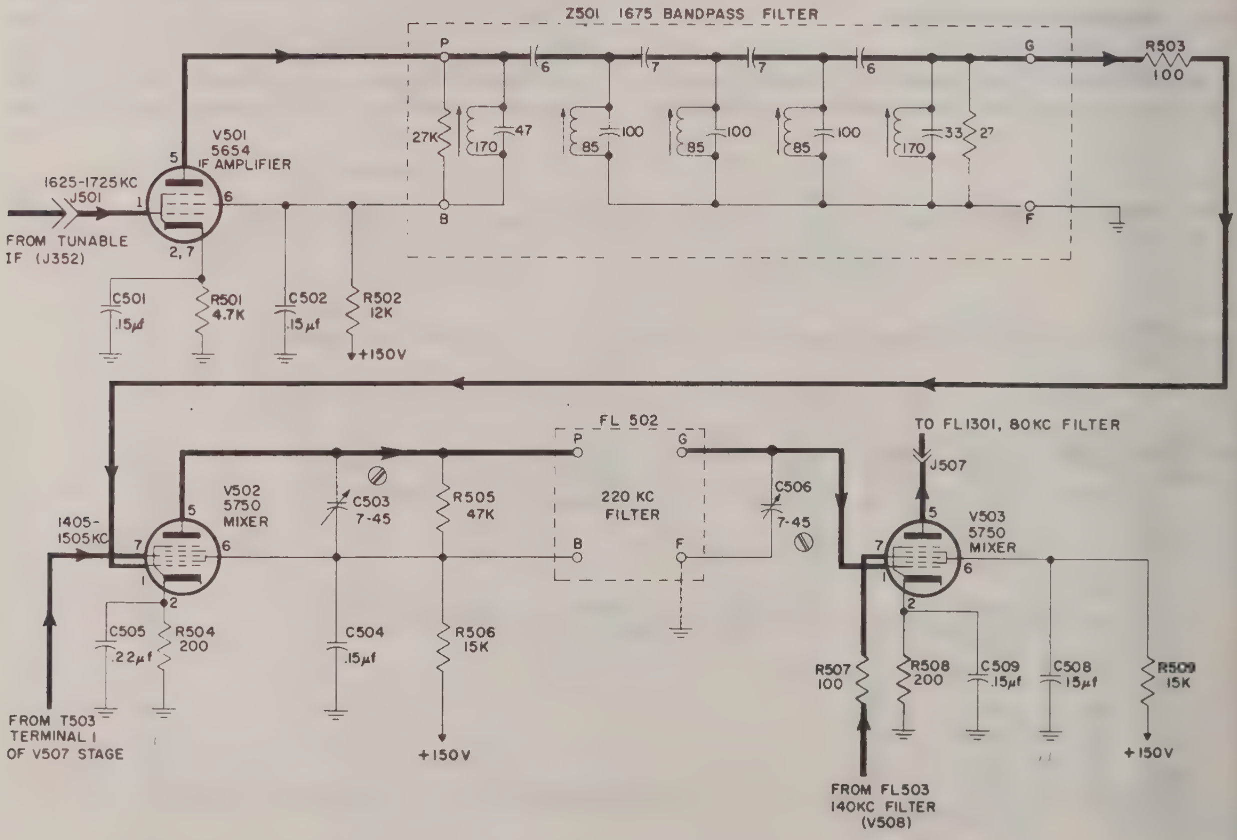

Z501 1675 BANDPASS FILTER
P
6
7
7
6
G
R503
100
27K
170
47
85
100
85
100
85
100
170
33
27
B
F
V501
5654
IF AMPLIFIER
5
6
1
2,7
1625-1725KC
J501
FROM TUNABLE IF (J352)
C501
.15μf
R501
4.7K
C502
.15μf
R502
12K
+150V
FL 502
P
G
220 KC FILTER
B
F
TO FL1301, 80KC FILTER
J507
V502
5750
MIXER
5
7
6
1
2
1405-1505KC
C503
7-45
R505
47K
C506
7-45
V503
5750
MIXER
5
7
6
1
2
C505
.22μf
R504
200
C504
.15μf
R506
15K
+150V
R507
100
R508
200
C509
.15μf
C508
.15μf
R509
15K
+150V
FROM T503 TERMINAL 1 OF V507 STAGE
FROM FL503 140KC FILTER (V508)

Figure 4-12. IF Amplifier V501 and Mixers V502 and V503, Simplified Schematic Diagram

same with increase in the frequency of each, provided that each signal increases by an identical amount prior to mixing.

In figure 4-11, an incoming signal of frequency F1 is injected into mixer 1. The high-frequency oscillator output (F3) is applied to the same mixer. The output from mixer 1 is the difference frequency of F3-F1 which, after being amplified in IF amplifier IF-1, is applied as one input of mixer 2. A similar process occurs in mixer 3, using as inputs the same high-frequency oscillator signal and an added locally generated signal (F2) from the receiver's crystal oscillator. The output from mixer 3 (F3-F2) is applied to mixer 2 through IF amplifier INJ-1. The difference frequency produced in mixer 2 is F2-F1, and the high-frequency oscillator signal (F3) is eliminated from the output.

c. IF AMPLIFIER V501, MIXERS V502 AND V503.—As shown in figure 4-12, the output of the tunable IF filter is supplied to IF amplifier V501 through J352 and J501. The plate load of V501 is bandpass filter Z501. Filter Z501 has a 100 kc bandpass with a center operating frequency of 1,675 kc. The output of the filter is applied to grid 1 (pin 1) of mixer tube V502. The second signal required for mixing action is applied to the other input, grid 3 (pin 7) of V502. This signal is obtained from T503 which is the output load of IF amplifier V507. The input signals to the mixer (V502) are so related that a difference-frequency signal of 220 kc will appear at the input of bandpass filter FL502. This filter is designed to operate at 220 kc but will pass signals in the range of 213.5 kc to 226.5 kc. The 220 kc signal is now passed on to the input grid (pin 1) of V503, which, after receiving another signal (140 kc) from 140 kc amplifier V508 at its other input grid (pin 7), mixes the two signals to produce the final intermediate frequency of 80 kc. The plate load for mixer V503 is the 80 kc filter assembly located in the demodulator.

d. IF AMPLIFIERS V504 AND V505.—As shown in figure 4-10, the development of the 1,405 to 1,505 kc signal used by mixer V502 is dependent on inputs from the interpolation oscillator (580 kc to 680 kc) and the harmonic mixer (825 kc). The 825 kc input from the harmonic mixer enters the injection IF amplifier at terminal 3 of T501 (figure 4-13). Intermediate frequency unit T501 is tuned to 825 kc and develops the input signal which is applied across R511 (grid resistor of V504). The output of IF amplifier V504 is impressed across bandpass filter FL504, the center operating frequency of which is 825 kc. This filter passes all signals in the range of 810 kc to 840 kc. The output of FL504 is applied to IF amplifier V505 through

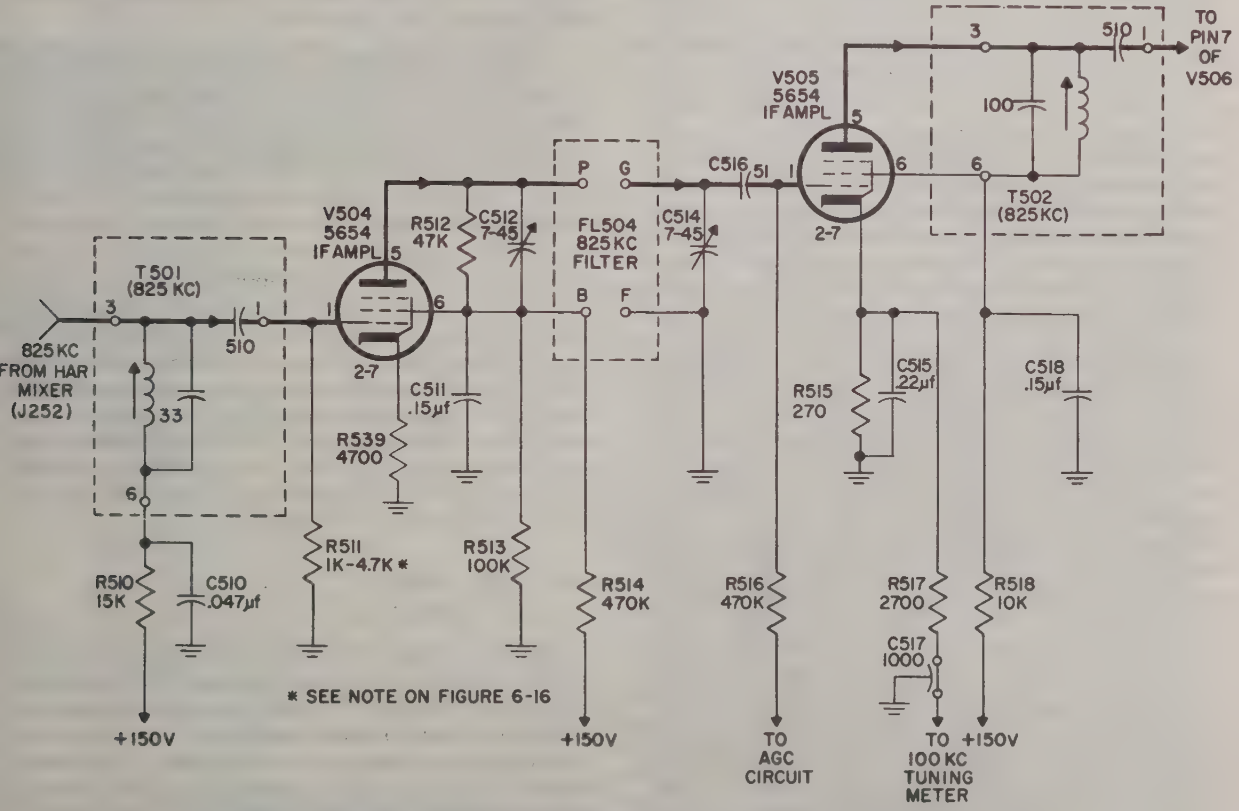

T501
(825 KC)
3
1
6
510
33
825 KC
FROM HAR
MIXER
(J252)
R510
15K
C510
.047µf
+150V
V504
5654
IF AMPL
5
1
6
2-7
R512
47K
C512
7-45
C511
.15µf
R539
4700
R511
1K-4.7K *
R513
100K
P
G
B
F
FL504
825 KC
FILTER
C514
7-45
R514
470K
+150V
C516
51
V505
5654
IF AMPL
5
1
6
2-7
R516
470K
TO
AGC
CIRCUIT
R515
270
C515
.22µf
R517
2700
C517
1000
TO
100 KC
TUNING
METER
C518
.15µf
R518
10K
TO +150V
3
510
1
100
6
T502
(825KC)
TO
PIN 7
OF
V506
* SEE NOTE ON FIGURE 6-16

Figure 4-13. IF Amplifiers V504 and V505, Simplified Schematic Diagram

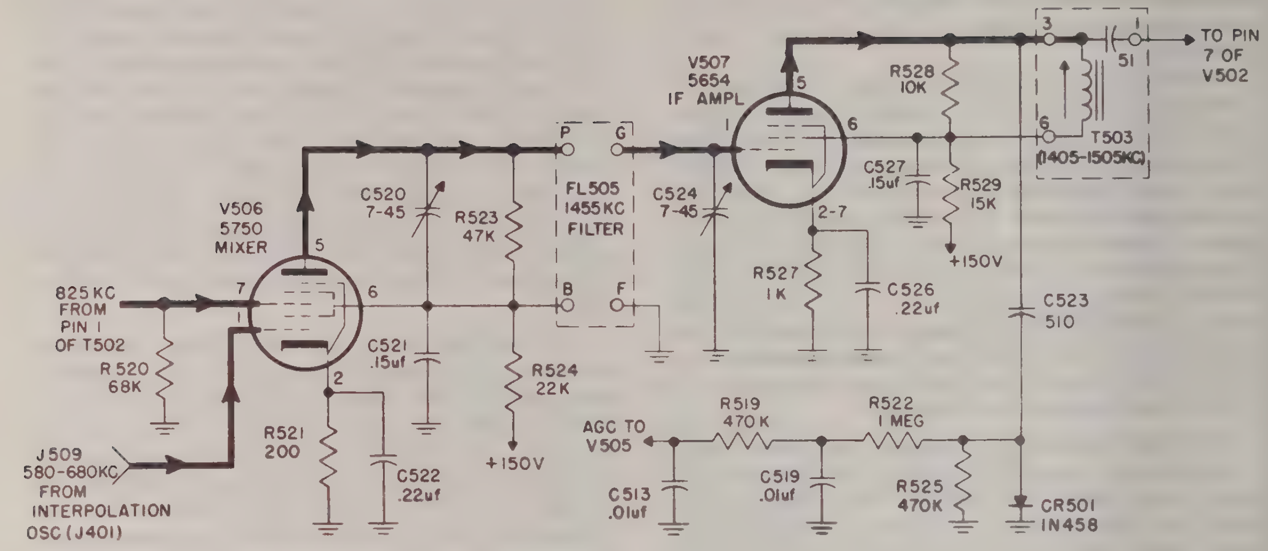


Figure 4-14. Mixer V506 and IF Amplifier V507, Simplified Schematic Diagram

coupling capacitor C516. The plate load of V505 is another intermediate frequency unit (T502, with characteristics similar to those of T501). The output from T502 is applied to pin 7 of V506 (figure 4-14). An AGC voltage, developed at the output circuit of V507, is applied to the control grid of V505 (figure 4-13). When the signal amplitude tends to increase, a greater negative AGC voltage is applied to V505. This reduces the gain of the amplifier, thus reducing the amplitude of its output. Conversely, a decrease in amplitude results in a less negative AGC voltage applied to V505 and a corresponding increase in signal amplitude at mixer V506 (figure 4-14). Provisions for monitoring the plate current are provided in the cathode circuit of V505 (figure 4-13). This feature is used when the receiver is tuned (TUNING △F = 100 KC control).

e. MIXER V506, IF AMPLIFIER V507.—As shown in figure 4-14, mixer V506 receives inputs from T502 (825 kc) and from the interpolation oscillator (580 kc to 680 kc) through J509. These inputs are mixed in V506 and supplied to bandpass filter FL505. The output of V506 contains signal components of the following frequencies: (1) 580 to 680 kc, (2) 825 kc, (3) the difference between 825 kc and the 580-to-680 kc range, and (4) the sum of the 825 kc and the 580-to-680 kc range. Since filter FL505 is tuned to the 1,405-to-1,505 kc range, only the sum frequency component of the V506 output will be passed to pin 1 of V507. The amplified output of V507 is developed at T503 and applied to mixer V502 (figure 4-12). A portion of the V507 output is coupled to AGC diode CR501 through capacitor C523. The shunt-connected diode clamps the positive half-cycle of the output signal to ground but allows the negative half-cycle to continue on through to an RC filter network comprised of R525, R522, C519, R519, and C513. The negative AGC voltage built up in the RC filter network is supplied to the control grid of V505 (figure 4-13). The extent of this negative voltage depends on the amplitude of the incoming signal to IM amplifier V507 (figure 4-14).

f. 140 KC AMPLIFIER.—The 140 kc signal from the synthesizer to the injection IF amplifier is supplied through connector J511 (figure 4-15). The 140 kc signal is amplified by V508 and applied to bandpass filter FL503 through capacitors C534, C535, and C536. The output signal from V508 is applied also to AGC diode CR502. Diode CR502 shunts the positive halfcycle of the V508 output signal to ground but permits the negative cycles to pass on to an RC filter network comprised of R536, C529, and R530. The negative voltage from the RC network is applied to the control grid of 140 kc amplifier V508. AGC action is thereby achieved in that a proportionate negative voltage corresponding to the output signal amplitude of V508 is developed and fed back to the control grid of V508. Provisions for monitoring the plate current are provided in the cathode circuit of V508. This feature is used when the receiver is tuned (TUNING control).

4-7. 80 KC FILTER

(See figure 4-16).

The 80 kc filter (FL1301) accepts the 80 kc intermediate frequency developed by mixer V503 (third conversion mixer figure 4-12) and passes it to two detector-amplifier sections of the demodulator. The filter has a center operating frequency of 80 kc with a 12 kc bandwidth. The 80 kc input is applied to the filter through connector J1301. The output of FL1301 is applied to the USB detector-amplifier through connectors J1302

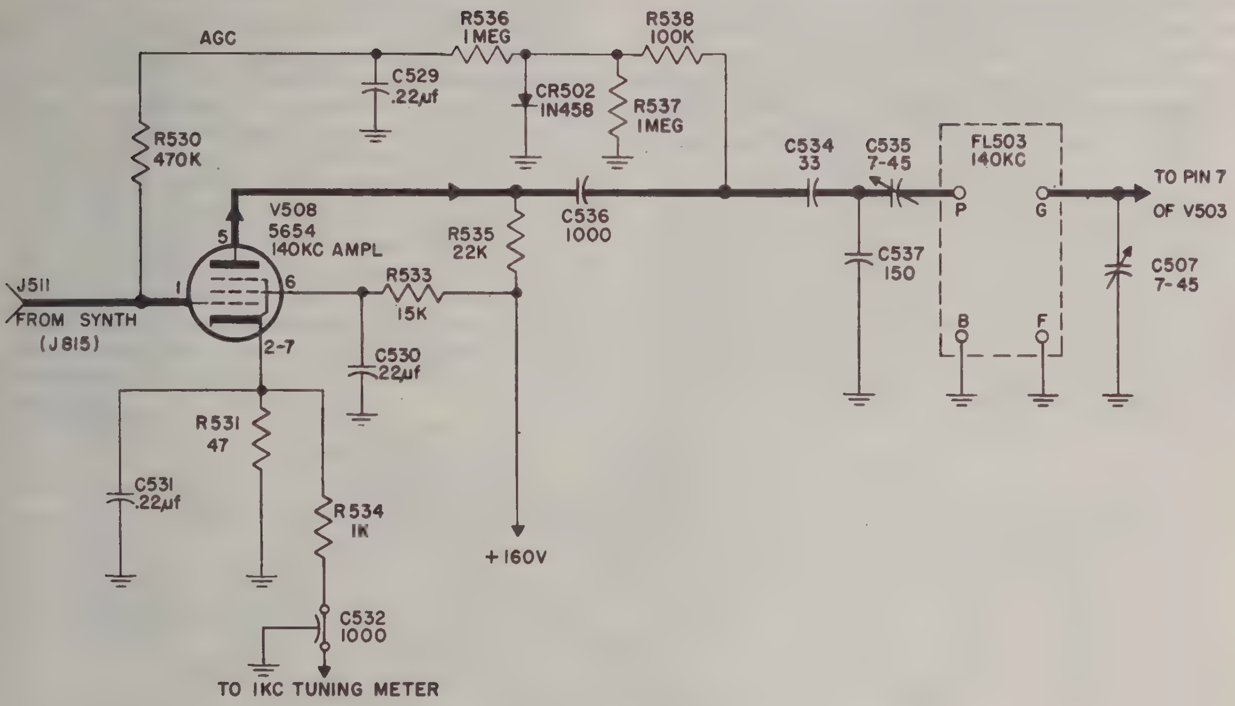

AGC
R536
1MEG
R538
100K
C529
.22µf
CR502
1N458
R537
1MEG
R530
470K
C534
33
C535
7-45
FL503
140KC
P
G
TO PIN 7
OF V503
V508
5654
140KC AMPL
5
1
6
2-7
C536
1000
R535
22K
R533
15K
C537
150
C507
7-45
B
F
J511
FROM SYNTH
(J815)
C530
.22µf
R531
47
C531
.22µf
R534
1K
+160V
C532
1000
TO 1KC TUNING METER

Figure 4-15. 140 Kc Amplifier, Simplified Schematic Diagram

d J1001 and to the AM detector-amplifier through nnectors J1303 and J1601. The LSB detector-ampli- r does not receive its 80 kc input signal directly from e 80 kc filter. The 80 kc signal supplied to the USB tector-amplifier is first amplified and then applied to e LSB section.

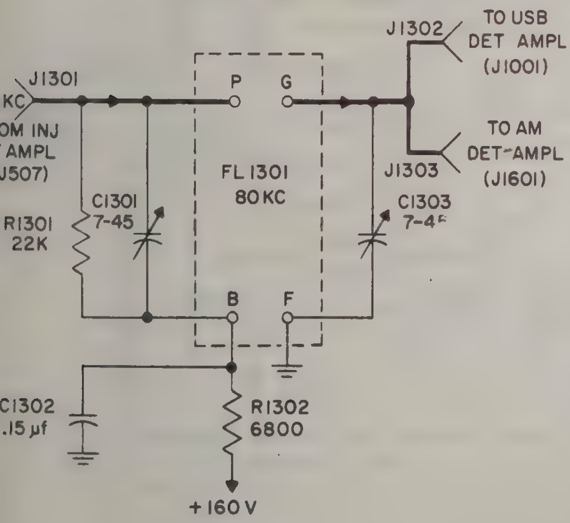

J1301
KC
OM INJ
AMPL
J507)
P
G
J1302
TO USB
DET AMPL
(J1001)
TO AM
DET-AMPL
(J1601)
J1303
FL1301
80KC
C1301
7-45
C1303
7-45
R1301
22K
B
F
C1302
.15µf
R1302
6800
+160V

Figure 4-16. 80 Kc Filter, Simplified Schematic Diagram

4-8. AMPLITUDE MODULATION (AM) DETECTOR-AMPLIFIER.

(See figure 4-17.)

As shown in figure 4-17, the AM detector-amplifier consists of 80 kc IF amplifiers, an AGC circuit, a detector, a noise limiter, several audio amplifiers, and a beat-frequency oscillator. The AM detector-amplifier receives its 80 kc input from the 80 kc filter. The 80 kc signal is amplified by a four-stage IF amplifier (V1601 through V1604) and applied to detector CR1603. After detection, the audio signal is amplified in a four-stage AM amplifier. The output of the last stage is supplied as one of two possible outputs at the LINE A output connector. An AGC circuit provides gain control for the last three IF amplifier stages. This control is of the delayed type, allowing weak signals to be received more readily before AGC prevails, while also limiting strong signals to a level below the saturation point of the detector voltage/current characteristic. The AGC voltage is applied also to a tuning meter which indicates resonance in the front-end tuned circuits (preselector) and to silencer V1608B.

The silencer has in its plate circuit the coil of a single-pole, double-throw relay (subpar. *e*). In addition, two voltages are impressed on the grid input of the silencer, one positive, from a potentiometer, the other an AGC voltage. With no signal at the receiver input, the AGC circuit remains inoperative, so that only the positive voltage from the potentiometer divider

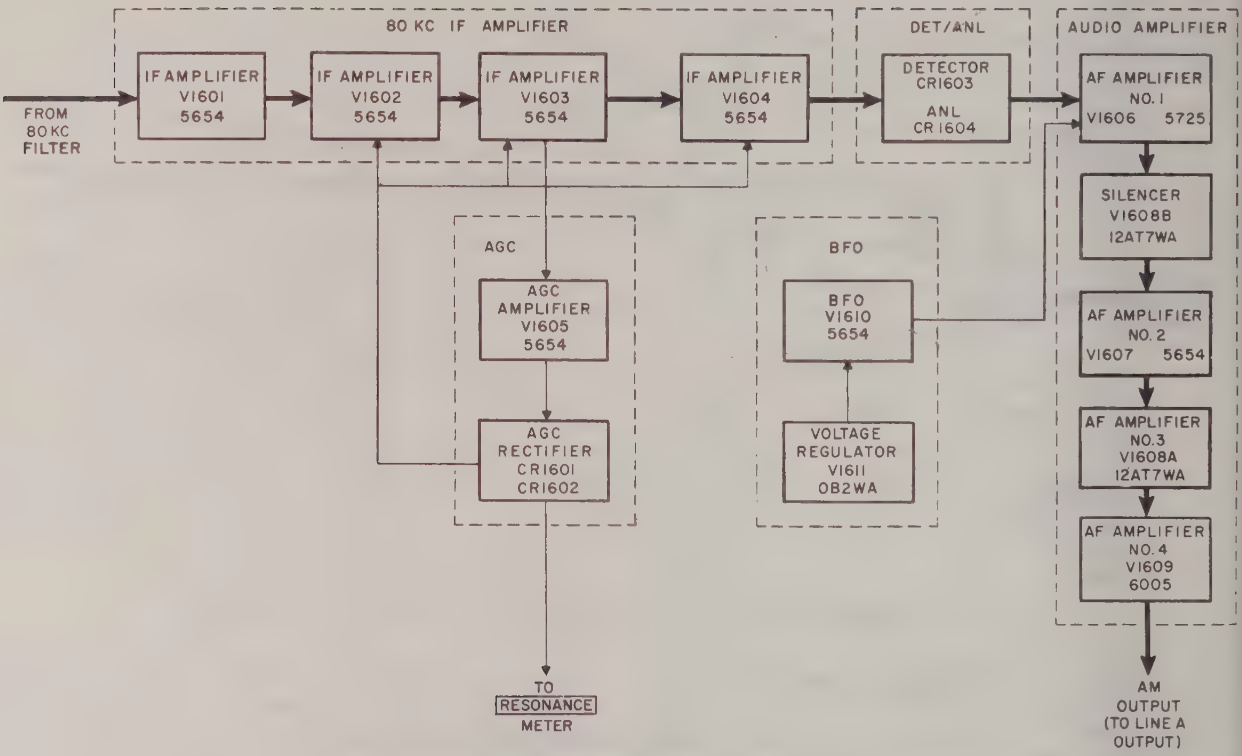

80 KC IF AMPLIFIER
FROM 80 KC FILTER
IF AMPLIFIER V1601 5654
IF AMPLIFIER V1602 5654
IF AMPLIFIER V1603 5654
IF AMPLIFIER V1604 5654
DET/ANL
DETECTOR CR1603
ANL CR1604
AUDIO AMPLIFIER
AF AMPLIFIER NO. 1 V1606 5725
SILENCER V1608B 12AT7WA
AF AMPLIFIER NO. 2 V1607 5654
AF AMPLIFIER NO.3 V1608A 12AT7WA
AF AMPLIFIER NO. 4 V1609 6005
AM OUTPUT (TO LINE A OUTPUT)
AGC
AGC AMPLIFIER V1605 5654
AGC RECTIFIER CR1601 CR1602
TO RESONANCE METER
BFO
BFO V1610 5654
VOLTAGE REGULATOR V1611 0B2WA

Figure 4-17. AM Detector-Amplifier, Block Diagram

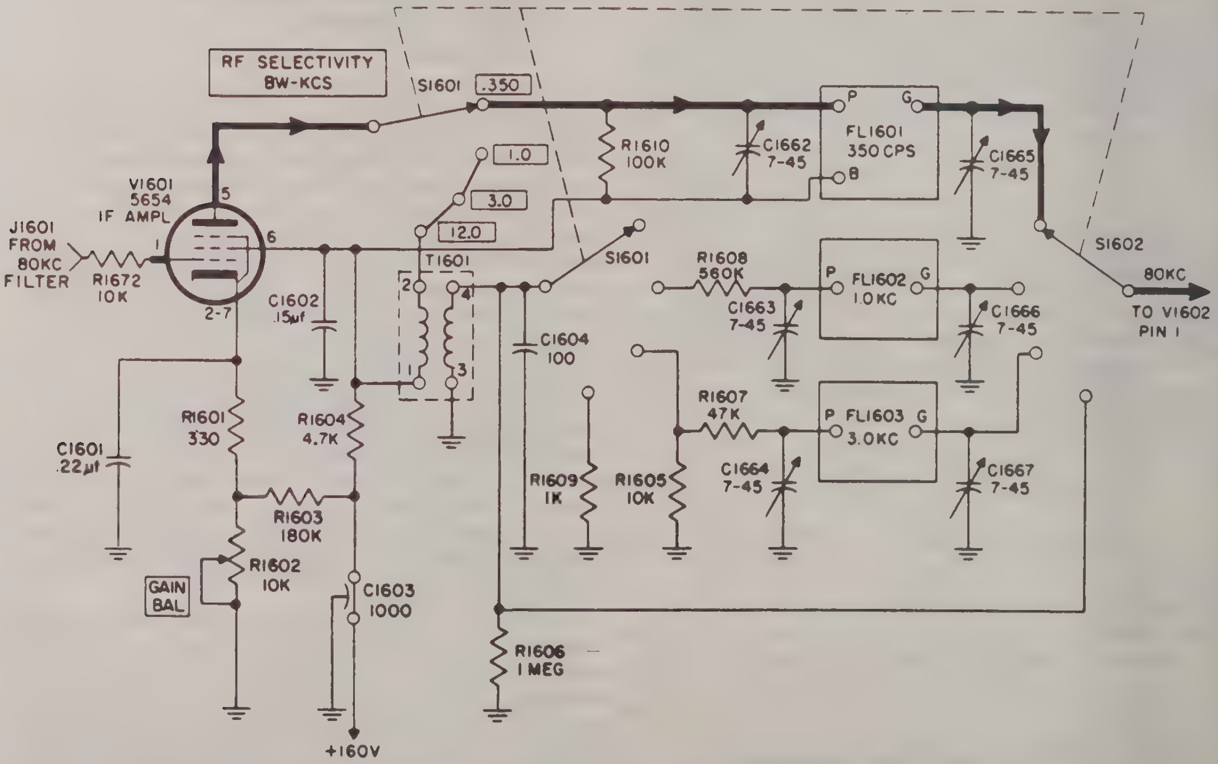

RF SELECTIVITY BW-KCS
S1601
.350
1.0
3.0
12.0
V1601 5654 IF AMPL
J1601 FROM 80KC FILTER
R1672 10K
5
6
1
2-7
C1602 .15µf
T1601
2
4
1
3
S1601
R1610 100K
C1662 7-45
FL1601 350 CPS
P
G
B
C1665 7-45
S1602
80KC TO V1602 PIN 1
R1608 560K
C1663 7-45
FL1602 1.0KC
C1666 7-45
C1604 100
R1607 47K
FL1603 3.0KC
C1664 7-45
C1667 7-45
R1609 1K
R1605 10K
C1601 .22µf
R1601 330
R1604 4.7K
R1603 180K
R1602 10K
GAIN BAL
C1603 1000
R1606 1 MEG
+160V

Figure 4-18. IF Amplifier V1601, Simplified Schematic Diagram

is applied to the silencer. This causes the silencer to conduct, energizing the relay coil and actuating the relay armature. The armature grounds the input of the second AF amplifier stage and so prevents the development of any output by later audio amplifier stages. When a signal does appear and when, as a result, the AGC circuit sets up a gain-control voltage at the silencer grid, there is an overriding effect. The negative AGC voltage combines with the positive bias at this grid. The net cancellation of voltage increases the grid bias and reduces the silencer plate current to such an extent that silencer relay coil becomes deenergized. The armature returns to its normally open position and removes the ground from the second AF amplifier stage. The incoming signal can now pass to the final audio amplifier.

When A1, F1, or F4 signals are received, a BFO signal is combined with them and both are applied to first audio amplifier V1606 (subpar. *d*). The BFO operates (for CW) at a frequency 1 kc higher than the IF signal it mixes with, producing a 1 kc output signal that is applied to V1607 (subpar. *e*.).

a. 80 KC IF AMPLIFIER. *(See figures 4-18 and 4-19.)* —The 80 kc IF amplifier has provisions for selection of four possible bandwidths—0.35 kc, 1 kc, 3 kc, and 12 kc, depending on the nature of received signals. These bandwidths are selected by the R.F. SELECTIVITY BW-KCS control. As shown in figure 4-18, the signal from the 80 kc IF filter is applied to IF amplifier V1601 through connector J1601. The gain of V1601 is controlled by GAIN BAL potentiometer R1602, which

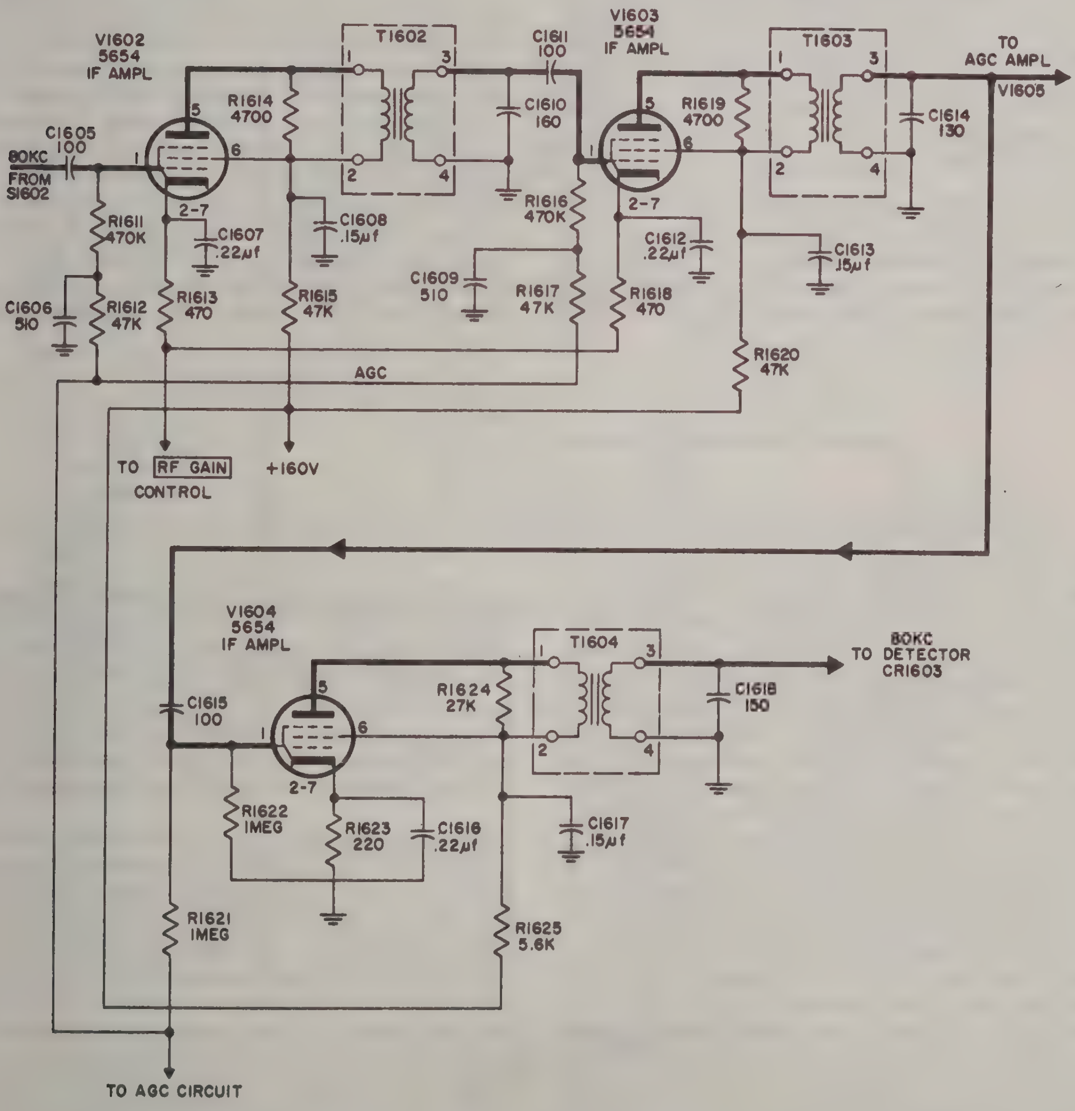

V1602
5654
IF AMPL
T1602
C1611
100
V1603
5654
IF AMPL
T1603
TO
AGC AMPL
V1605
C1605
100
80KC
FROM
S1602
R1614
4700
C1610
160
R1619
4700
C1614
130
R1611
470K
C1607
.22µf
C1608
.15µf
R1616
470K
C1612
.22µf
C1613
.15µf
C1609
510
C1606
510
R1612
47K
R1613
470
R1615
47K
R1617
47K
R1618
470
R1620
47K
AGC
TO RF GAIN
CONTROL
+160V
V1604
5654
IF AMPL
T1604
80KC
TO DETECTOR
CR1603
R1624
27K
C1618
150
C1615
100
R1622
1MEG
R1623
220
C1616
.22µf
C1617
.15µf
R1621
1MEG
R1625
5.6K
TO AGC CIRCUIT
1
2
3
4
5
6
2-7

Figure 4-19. IF Amplifiers V1602, V1603, and V1604, Simplified Schematic Diagram

supplies a fixed bias voltage to the amplifier cathode. The RF SELECTIVITY BW-KCS control is shown in 0.35 position, in which filter FL 1601 becomes the plate load for V1601. In the other positions, the plate load is IF transformer T1601. In position 1.0, the output of T1601 is applied to filter FL1602, providing a 1.0 kc IF bandwidth. In position 3.0, the T1601 output goes to FL1603; at 12.0 it goes directly to IF amplifier V1602 for a full 12.0 kc bandwidth.

Figure 4-19 shows the signal from the selected bandpass filter applied to V1602 through C1605. The output of V1602 is developed across IF transformer T1602 and applied to IF amplifier V1603 via C1611. The gain of V1602 and V1603 is governed by the R.F. GAIN control. The output of V1603 is developed across T1603 and applied to IF amplifier V1604 through C1615. A portion of this signal at T1603 is applied also to the AGC circuit. V1604 develops its output across T1604 and applies it to the detector stage (subpar. *c*). An AGC voltage is applied to the control grids of amplifiers V1602, V1603, and V1604 to maintain control of the output signal amplitude. The development of this AGC voltage is described in subparagraph *b* below.

b. AUTOMATIC GAIN CONTROL CIRCUIT. *(See figure 4-20)*—An 80 kc IF signal taken from pin 3 of the secondary of interstage transformer T1603 (figure 4-19) is applied to the grid of AGC amplifier V1605. The amplified output of V1605 is developed at IF transformer T1605 and applied to the anode of AGC diode CR1601. The signal is rectified at this point and passed through R1629 and the RESONANCE meter. The AGC voltage developed across R1629 is filtered and divided by capacitors C1622, C1623, and C1624 and resistors R1630, R1631, R1633, R1634, and R1635. AGC voltage is made available at point A, from which it is applied to IF amplifiers V1602, V1603, and V1604, and at point B, from which it is applied to the grid of silencer tube V1608B and to RESONANCE meter M601.

The basic AGC circuit described above is supplemented by three added features. One is the delay in AGC action introduced into the load to permit weak signals to be received more readily before AGC action takes over and reduces the gain of the IF amplifiers. The delay is produced by the biasing of CR1601 with a voltage produced by voltage divider R1632-R1635. Therefore, A is positive with respect to ground, and any negative (rectified dc) voltage at points A and B (with diode CR1602 nonconducting) must exceed the positive voltage at A to produce AGC at point B.

Another feature of the AGC circuit is that points A and B cannot go excessively positive; this protects the tubes to which A and B are connected. Also, in case AGC action is missing, point A becomes clamped to ground, protecting the IF amplifiers to which it is connected. This protection is afforded by the insertion into the AGC circuit of diode CR1602, shunted by capacitor C1624. When there is no signal voltage at

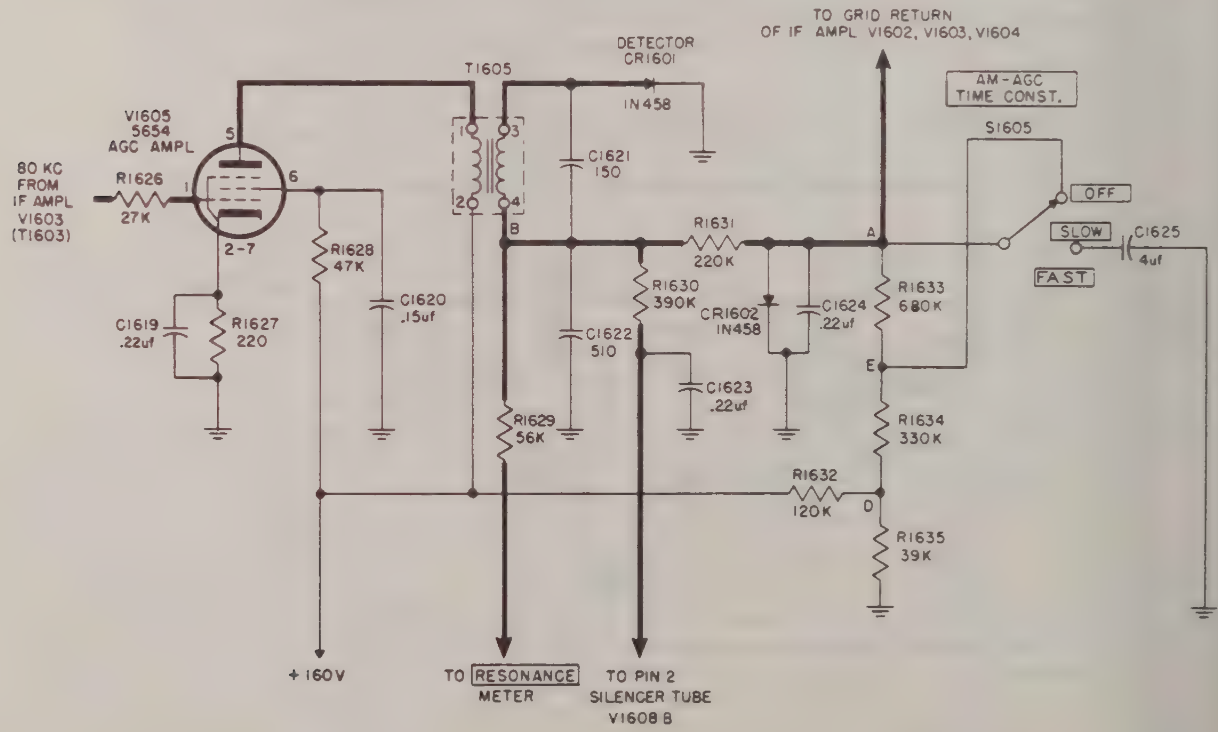

TO GRID RETURN
OF IF AMPL V1602, V1603, V1604
DETECTOR
CR1601
T1605
IN458
AM-AGC
TIME CONST.
S1605
V1605
5654
AGC AMPL
5
80 KC
FROM
IF AMPL
V1603
(T1603)
R1626
27K
1
6
C1621
150
1
3
2
4
OFF
R1631
220K
A
SLOW
C1625
4uf
FAST
B
2-7
R1628
47K
R1630
390K
CR1602
IN458
C1624
.22uf
R1633
680K
C1620
.15uf
C1619
.22uf
R1627
220
C1622
510
E
C1623
.22uf
R1629
56K
R1634
330K
R1632
120K
D
R1635
39K
+160V
TO RESONANCE
METER
TO PIN 2
SILENCER TUBE
V1608 B

Figure 4-20. Automatic Gain Control Circuit of AM Detector-Amplifier, Simplified Schematic Diagram

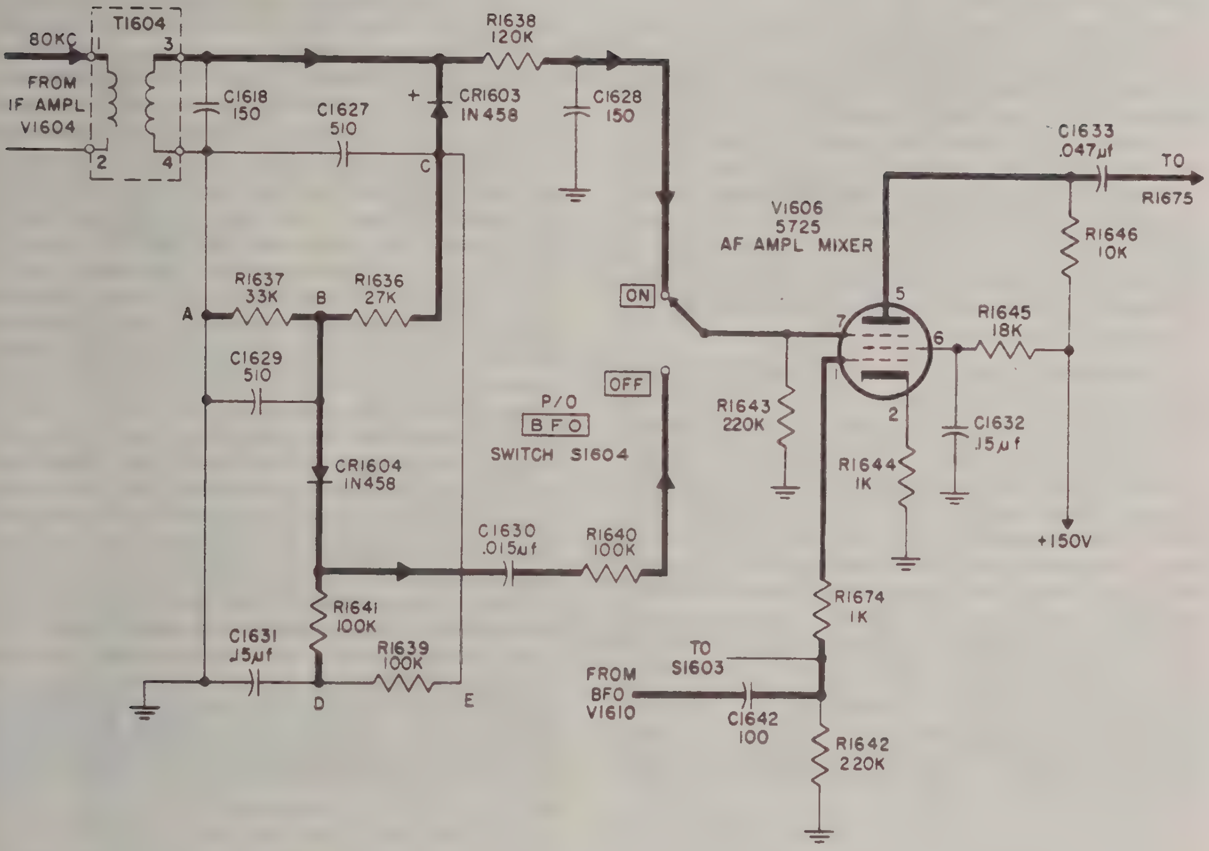

80KC
FROM
IF AMPL
V1604
T1604
1
2
3
4
C1618
150
C1627
510
+
CR1603
IN458
C
R1638
120K
C1628
150
C1633
.047µf
TO
R1675
R1646
10K
V1606
5725
AF AMPL MIXER
5
7
6
1
2
R1645
18K
ON
OFF
P/O
BFO
SWITCH S1604
R1637
33K
A
B
R1636
27K
C1629
510
CR1604
IN458
R1643
220K
C1632
.15µf
R1644
1K
+150V
C1630
.015µf
R1640
100K
R1641
100K
C1631
.15µf
R1639
100K
D
E
R1674
1K
TO
S1603
FROM
BFO
V1610
C1642
100
R1642
220K

Figure 4-21. Detector CR1603 and Automatic Noise Limiter CR1604, Simplified Schematic Diagram

the secondary of transformer T1605, diode CR1602 conducts as a result of the positive voltage at A. This clamps point A to ground (ignoring the small voltage across the anode-cathode resistance of the diode). If a sufficiently large negative voltage now appears at point B, it overrides the positive voltage originally at A and causes diode CR1602 to become nonconducting. This makes available an AGC negative voltage at points A and B.

A third feature of the AGC circuit is its provision for varying time constants by means of the A.M.-A.G.C. TIME CONST. control (S1605) on the upper demodulator panel. This switch connects capacitors of different capacitances across diode CR1602. In the FAST position, capacitor C1624 is connected across CR1602, and at SLOW C1625 is switched in parallel with C1624. At OFF, resistor R1633 is shorted out, increasing the delay effect of the AGC circuit, there being a larger positive voltage at point A, with a correspondingly larger negative voltage required at B before AGC action can take over again. In effect, AGC is reduced to a small residual value for low signal levels.

c. DETECTOR CR1603, AUTOMATIC NOISE LIMITER CR1604. *(See figure 4-21.)*—The 80 kc output developed at T1604 (plate load of IF amplifier V1604) is applied to CR1603, which is used in a conventional diode detector circuit. The output of the detector is developed across load resistors R1636 and R1637 and applied to the B.F.O. switch (S1604), on the upper demodulator panel, through a filter network consisting of R1638 and C1628. Also associated with the detector is a series-connected automatic noise limiter, CR1604, which limits voltage surges. The noise limiter becomes a functional part of the receiver only when the B.F.O. switch is in the OFF position.

The negative half of the modulated IF signal at the secondary of transformer T1604 causes conduction in diode CR1603 of the detector circuit, making point B negative with respect to A (ground). When normal signals are received, detector action causes B to be more negative than A; therefore, the anode of CR1604 is negative to ground. Point D, however, is normally more negative than B, so that CR1604 conducts, and AF signals are available at the cathode side of load resistor R1641. Capacitor C1631 also charges during conduction and at a rate determined by the time constant (R1639 and C1631).

When there is a noise peak appreciably higher than the signal level, a large negative voltage is impressed suddenly on detector load resistors R1636 and R1637, making point B, and hence the anode of CR1604, highly negative with respect to ground. Because of the relatively long time constant of R1639 and C1631, however, the cathode of diode CR1604 cannot follow the sudden change. The anode of CR1604 now becomes negative with respect to its cathode, and the diode no longer conducts. This prevents the signal from reaching AF amplifier V1606 and keeps the receiver quiet during the surge of noise voltage.

d. AF AMPLIFIER V1606 *(See figure 4-21.)*—The input at pin 7 of AF amplifier V1606 is connected to either of two detector outputs, depending on whether the detector is used alone or in conjunction with the automatic noise limiter, as selected by the B.F.O. switch. A second input, applied at pin 1, is developed by BFO V1610 for all modes of receiver operation except modulated continuous wave (MCW) and amplitude modulation (AM), when V1606 operates as a conventional AF amplifier. The output of V1606 is developed across R1646 and is coupled through coupling capacitor C1633, to the audio filter circuit, which is composed of R1675, R1676, C1668, C1669, and C1670.

e. SILENCER CIRCUIT. *(See figure 4-22.)*—The silencer, or squelch, circuit, used principally for voice (A3) reception, cuts off receiver output when no signal is being received. The grid of silencer tube V1608B has two voltage sources—one, negative, from point B of the AGC circuit (figure 4-20) the other, positive, from potentiometer R1664, which is part of a voltage divider between regulated +105v and ground. Rotating the SILENCER control (upper demodulator panel) clockwise from its OFF position connects the cathode of V1608B to ground and simultaneously taps the voltage-divider network for a positive voltage to the grid of V1608B. If there is no signal at the receiver, the AGC circuit, being dependent for operation on an incoming signal, remains inactive. This makes the receiver extremely sensitive, permitting locally generated random noise and external interference to appear at the receiver output. With AGC inactive, the only voltage impressed on the grid of V1608B is that from voltage divider R1664. This makes the grid positive with respect to its cathode, resulting in a plate current sufficient to energize the coil of relay K1601, which is located in the plate circuit of V1608B. The plate current closes the normally open armature of K1601, grounding the input of the second AF amplifier (V1607) and preventing any signal from reaching the receiver output.

When there is a signal at the receiver input, a negative AGC voltage appears at the grid of V1608B, overriding its positive bias, reducing the tube's plate current, and de-energizing the coil of relay K1601. The relay armature reopens, removing the ground from the input of AF amplifier V1607 and permitting transfer of the AF signal through the output-limiter circuit

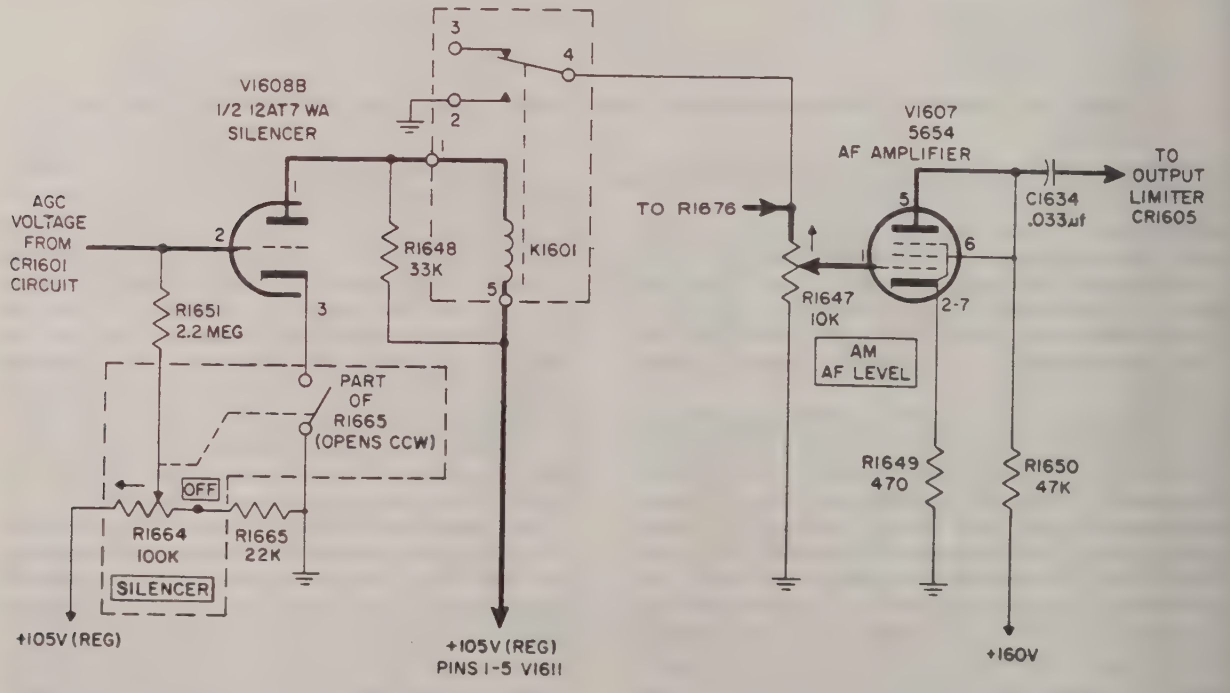


Figure 4-22. Silencer V1608B and AF Amplifier V1607, Simplified Schematic Diagram

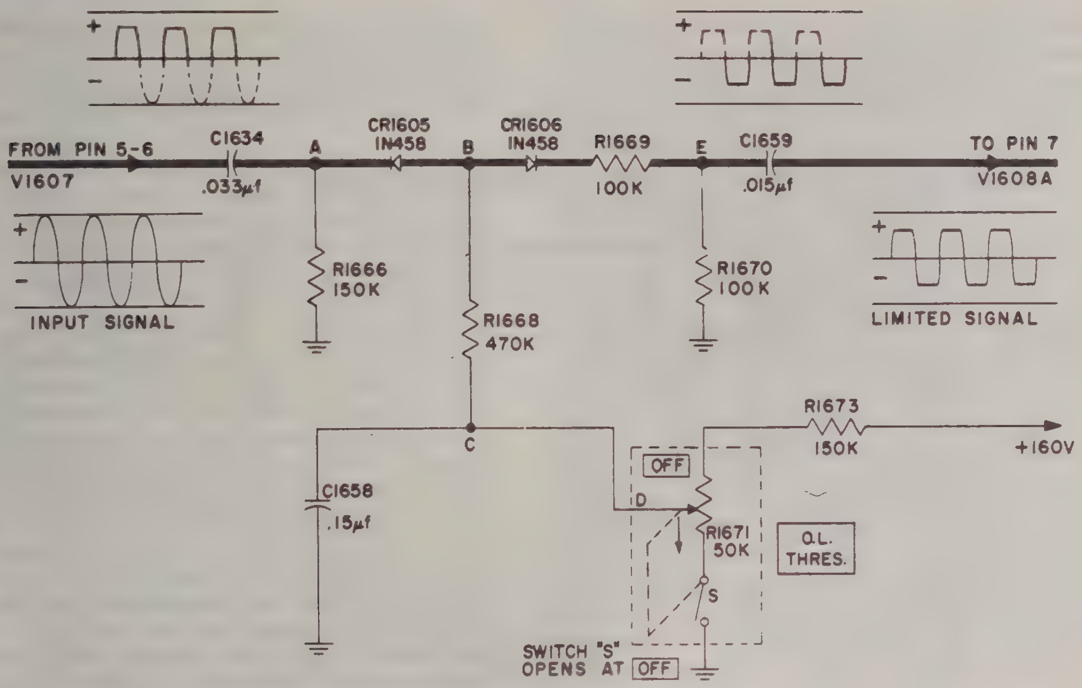


Figure 4-23. Output-Limiter Circuit CR1605 and CR1606, Simplified Schematic Diagram

(paragraph 4-8*f*) and the remaining AF amplifier stages (V1608A and V1609) to the receiver output.

The grid of V1608B is protected against excessive positive bias by a negative voltage drop across grid resistor R1651. In the absence of an AGC signal, the grid of V1608B is biased positively with respect to the cathode, and grid current flows, producing in resistor R1651 a voltage drop of polarity opposite that of the source of voltage divider R1664. Therefore, the voltage at the grid of V1608B with no AGC present equals the difference between source voltage and the voltage drop across grid load resistor R1651.

AF amplifier V1607 (figure 4-22) receives from R1676 (figure 6-18) an input developed across AM AF LEVEL control R1647, with the amplitude controlled by potentiometer R1647. The amplifier uses a pentode tube connected for triode operation. Its output is developed across plate load resistor R1650 and is coupled to the output-limiter circuit through capacitor C1634.

f. OUTPUT-LIMITER CIRCUIT. *(See figure 4-23.)* —The output-limiter circuit associated with the AM detector-amplifier is designed to limit the amplitude of the voltages to predetermined levels by clipping symmetrically both halves of the AF signal. The dc voltage level at which clipping occurs is governed by potentiometer R1671, a variable control to which is attached an on/off switch (S in figure 4-23). Both potentiometer and switch are operated by the O.L. THRES. control on the upper demodulator panel.

When switch S is closed (O.L. THRES. at any point but OFF) and there is no audio input at A, dc voltages are present at points A, B, and E, depending for their magnitude on the setting of D at R1671. AF signals applied at A are superimposed on the existing dc voltage, resulting in a varying AF voltage about the dc viltage. Both halves of the input AF cycle are limited at a level determined by the reference voltage on capacitor C1658 at C.

In the positive portion of the input signal cycle at A, as the varying AF signal increases in amplitude, the potential difference between points C and A becomes smaller. Since the voltage at C is still greater than that at A, there is still conduction through diode CR1605 and a consequent voltage drop across resistor R1668. This drop, however, is less than it was before application of AF voltage at A, because of the smaller difference in potential between points C and A. Therefore, the voltage at B is greater by the amount of decrease in voltage drop in R1668, and the voltage at E is correspondingly increased. This variation in AF voltage is impressed on the grid of V1608A (figure 4-24). Thus, all voltages on the positive half of the AF input signal are passed on to the V1608A grid so long as the voltage at which clipping occurs has not been reached.

When the positive voltage at A reaches (or exceeds) the reference position voltage at C, the diode (CR1605) anode potential at B becomes either equal to A or negative with respect to A. In either case, conduction through diode CR1605 ceases, and the AF signal is prevented from reaching the grid of V1608A. The signal is therefore clipped at this audio input level.

During the negative half of the input AF signal the potential between C and A increases, and with CR1605 conducting there is a greater voltage drop across R1668.

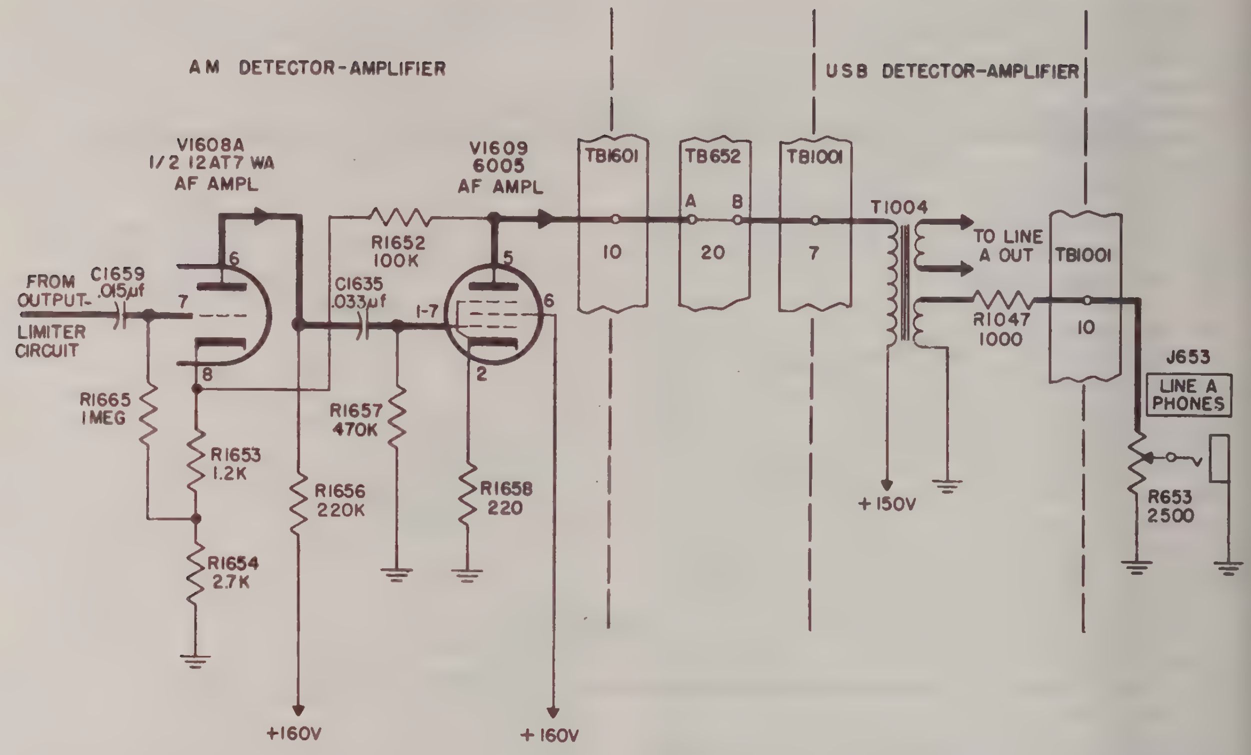

AM DETECTOR-AMPLIFIER
USB DETECTOR-AMPLIFIER
V1608A
1/2 12AT7 WA
AF AMPL
V1609
6005
AF AMPL
TB1601
10
TB652
A
B
20
TB1001
7
T1004
TO LINE
A OUT
TB1001
10
FROM
OUTPUT
LIMITER
CIRCUIT
C1659
.015µf
C1635
.033µf
R1652
100K
R1047
1000
J653
LINE A
PHONES
R1665
1MEG
R1653
1.2K
R1654
2.7K
R1656
220K
R1657
470K
R1658
220
R653
2500
+150V
+160V
+160V
6
7
8
5
1-7
6
2

Figure 4-24. AF Amplifiers V1608A and V1609, Simplified Schematic Diagram

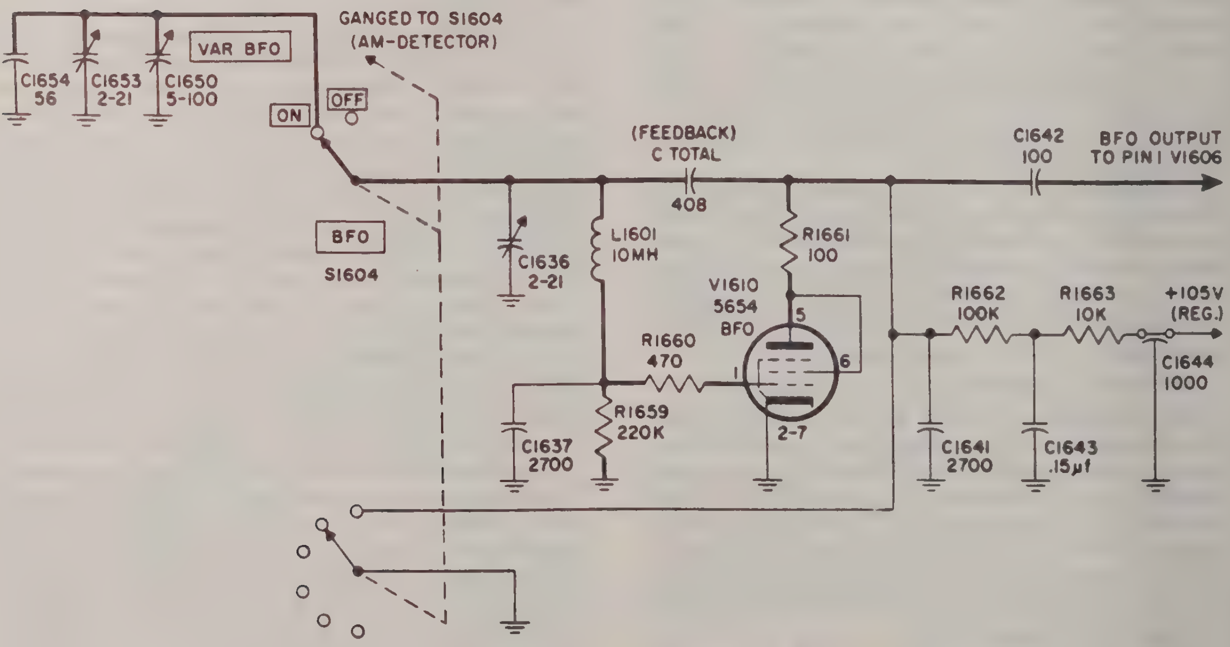

GANGED TO S1604
(AM-DETECTOR)
VAR BFO
C1654
56
C1653
2-21
C1650
5-100
ON
OFF
BFO
S1604
(FEEDBACK)
C TOTAL
408
C1642
100
BFO OUTPUT
TO PIN 1 V1606
C1636
2-21
L1601
10MH
R1661
100
V1610
5654
BFO
R1660
470
R1659
220K
C1637
2700
R1662
100K
R1663
10K
+105V
(REG.)
C1644
1000
C1641
2700
C1643
.15µf
5
6
1
2-7

Figure 4-25. Beat-Frequency Oscillator V1610, Simplified Schematic Diagram

This is reflected as a negative going voltage at the grid of V1608A. A negative variation in input voltage at the grid of V1608A occurs for all corresponding negative inputs at A until clipping occurs for the negative half-cycle of the audio waveform.

Clipping occurs when the negative input at A is large enough to cause the voltage drop across R1668 to exceed the positive reference voltage at C. The voltage drop in R1668 is negative going from C to B. Therefore, the net voltage between point B and ground is the difference between the voltage at C and the voltage drop across R1668. Since the voltage drop across R1668 exceeds the reference voltage at C, point B is now negative with respect to ground. This condition likewise causes the anode of diode CR1606 to be negative with respect to its cathode and the diode to become nonconducting. With CR1606 nonconducting, no AF signal reaches the grid of V1608A. Again clipping has been brought about, this time in the negative half of the audio signal.

When switch S is opened (O.L. THRES. at OFF), the voltage at C becomes so high relative to the audio input at A that the varying voltage is not subjected to clipping, and the signals are passed through from AF amplifier V1607 to AF amplifier V1608A without any effect on the audio waveform.

g. AF AMPLIFIERS V1608A and V1609. *(See figure 4-24.)*—Amplifiers V1608A and V1609 are conventional AF amplifiers except for the application, from the plate of V1609 to the cathode of V1608A, of a negative feedback applied through a voltage-divider network consisting of resistors R1652, R1653, and R1654. Feedback is derived also from unbypassed cathode resister R1658 of V1609. The input to the grid of V1608A is derived from the output-limiter circuit by way of capacitor C1659. The output of V1608A is developed across plate load resistor R1656 and coupled to the grid of V1609 through capacitor C1635. The output of V1609 is developed across output transformer T1004, which, though located in the USB detector-amplifier, is common to both USB and AM detector-amplifiers. T1004 has two outputs, one to LINE A OUT (located on demodulator blister) and one to LINE A PHONES (located at center of demodulator lower deck front panel).

h. BEAT-FREQUENCY OSCILLATOR. *(See figure 4-25.)*—The beat-frequency oscillator (BFO) operates in conjunction with the first AF amplifier (V1606) to provide reception of keyed CW and frequency-shift signals. BFO and 80 kc IF signals are heterodyned in V1606 to produce the desired beat note. The output frequency signal of the BFO is determined by the position of the B.F.O. switch on the upper demodulator panel. There are two positions. OFF position, with the BFO inoperative, is used for reception modes other than keyed CW and frequency-shift, ON position provides a frequency vernier control of approximately 3 kc either side of "zero beat."

4-9. UPPER-SIDEBAND DETECTOR-AMPLIFIER. *(See figure 4-26.)*

a. GENERAL.—Two detector-amplifiers comprise the single-sideband portion of the receiver, making possible either upper- or lower-sideband reception, or both simultaneously. This paragraph discusses operational theory of the upper sideband. Figure 4-26 is a related

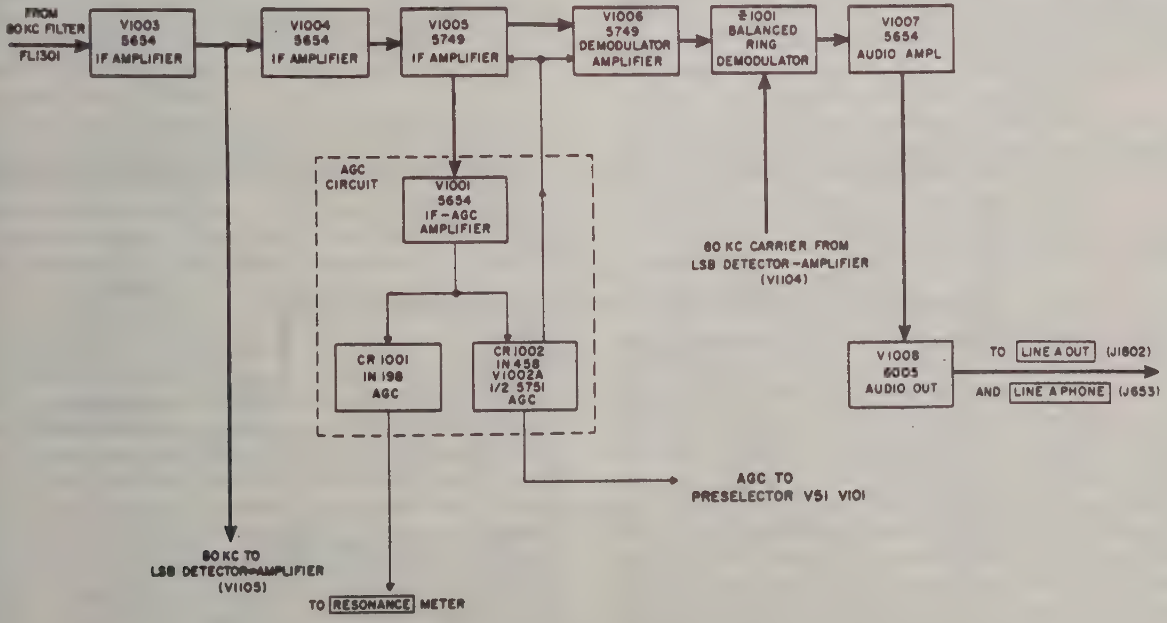

FROM
80KC FILTER
FL1301
V1003
5654
IF AMPLIFIER
V1004
5654
IF AMPLIFIER
V1005
5749
IF AMPLIFIER
V1006
5749
DEMODULATOR
AMPLIFIER
Z1001
BALANCED
RING
DEMODULATOR
V1007
5654
AUDIO AMPL
AGC
CIRCUIT
V1001
5654
IF-AGC
AMPLIFIER
CR 1001
IN 198
AGC
CR 1002
IN 458
V1002A
1/2 5751
AGC
80 KC CARRIER FROM
LSB DETECTOR-AMPLIFIER
(V1104)
V1008
6005
AUDIO OUT
TO LINE A OUT (J1602)
AND LINE A PHONE (J653)
AGC TO
PRESELECTOR V51 V101
80 KC TO
LSB DETECTOR-AMPLIFIER
(V1105)
TO RESONANCE METER

Figure 4-26. Upper-Sideband Detector-Amplifier, Block Diagram

functional block diagram. Lower-sideband operation is discussed in paragraph 4-10.

An input signal from the 80 kc filter is applied to a three-stage IF amplifier (V1003, V1004, and V1005). The amplified 80 kc output of V1003 is applied to both V1004 and the LSB detector-amplifier. The output of V1004 is applied to V1005, which, in turn, has two outputs. One is to demodulator amplifier V1006; the other is applied to IF-AGC amplifier V1001. The output of the latter is applied to diodes CR1001 and CR1002-V1002A. The rectified voltage from CR1001 is applied to RESONANCE meter M601; that from CR1002 and V1002A is fed back to provide gain control for both IF amplifier V1005 and demodulator amplifier V1006. Another output from CR1002 is applied through S654 and S657 to V51 and V101 of the preselector.

The output of V1006 is mixed in balanced-ring demodulator Z1001 with an 80 kc carrier signal. The audio frequency representing the difference between the signals is amplified by V1007 and V1008 and applied to LINE A OUT jack J1802 and LINE A PHONES jack J653.

b. IF AMPLIFIERS V1003, V1004, AND V1005. *(See figure 4-27.)*—The grid of V1003 receives its signal from the 80 kc filter through input connector J1001 and coupling capacitor C1013. The output of V1003 is developed across IF transformer T1002 and applied to IF amplifier V1004, also to the LSB detector-amplifier by way of connector J1002. The gain of V1003 is governed manually by the R.F. GAIN control on the lower converter panel and automatically by the voltage from

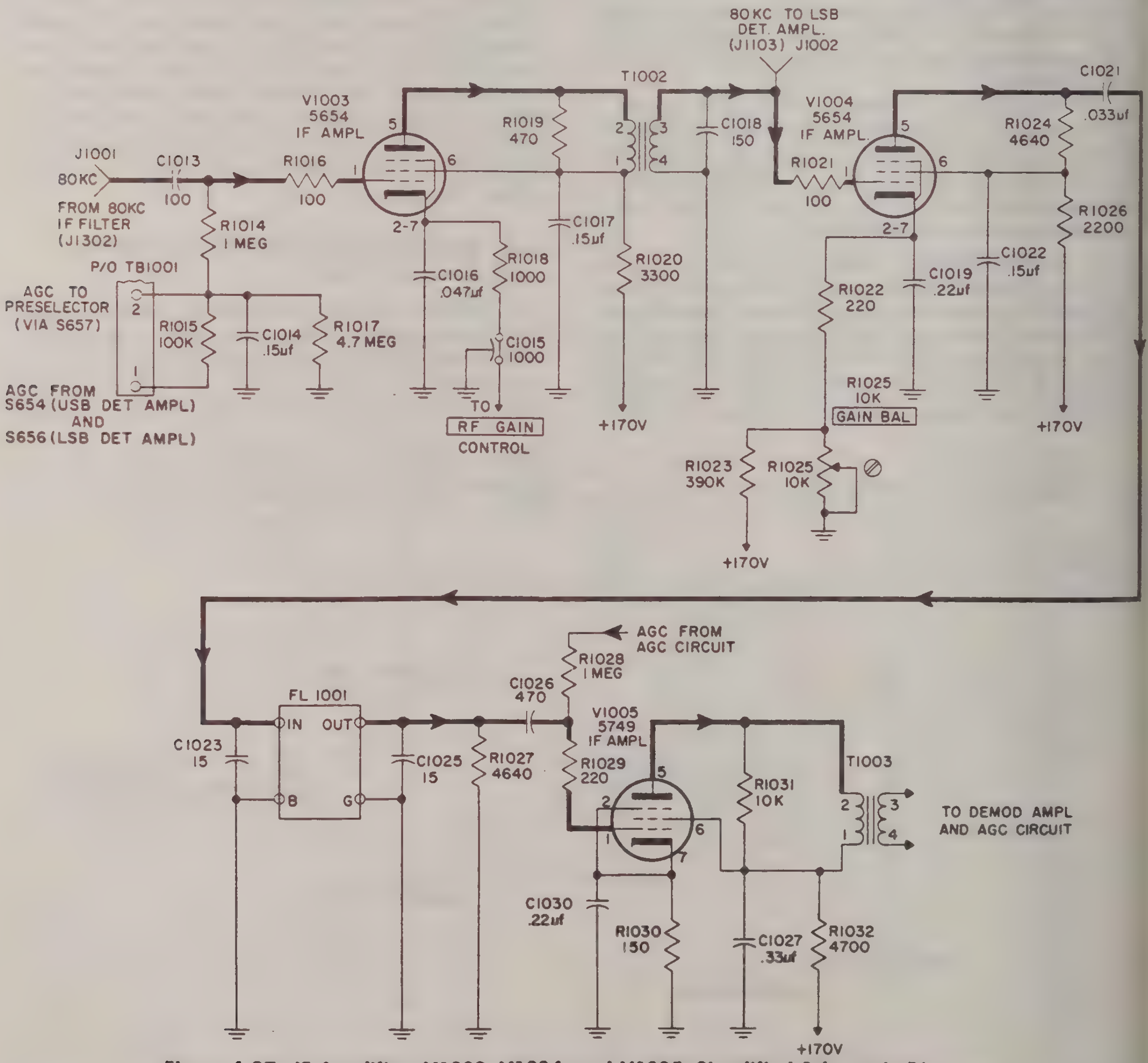

80KC TO LSB
DET. AMPL.
(J1103) J1002
T1002
C1021
.033uf
V1003
5654
IF AMPL
R1019
470
C1018
150
V1004
5654
IF AMPL.
R1024
4640
J1001
80KC
FROM 80KC
IF FILTER
(J1302)
C1013
100
R1016
100
R1021
100
R1026
2200
R1014
1 MEG
P/O TB1001
AGC TO
PRESELECTOR
(VIA S657)
R1015
100K
C1014
.15uf
R1017
4.7 MEG
C1016
.047uf
R1018
1000
C1015
1000
C1017
.15uf
R1020
3300
R1022
220
C1019
.22uf
C1022
.15uf
AGC FROM
S654 (USB DET AMPL)
AND
S656 (LSB DET AMPL)
TO
RF GAIN
CONTROL
+170V
R1025
10K
GAIN BAL
R1023
390K
R1025
10K
+170V
+170V
AGC FROM
AGC CIRCUIT
R1028
1 MEG
C1026
470
FL 1001
IN
OUT
B
G
V1005
5749
IF AMPL
C1023
15
C1025
15
R1027
4640
R1029
220
T1003
R1031
10K
TO DEMOD AMPL
AND AGC CIRCUIT
C1030
.22uf
R1030
150
C1027
.33uf
R1032
4700
+170V

Figure 4-27. IF Amplifiers V1003, V1004, and V1005, Simplified Schematic Diagram

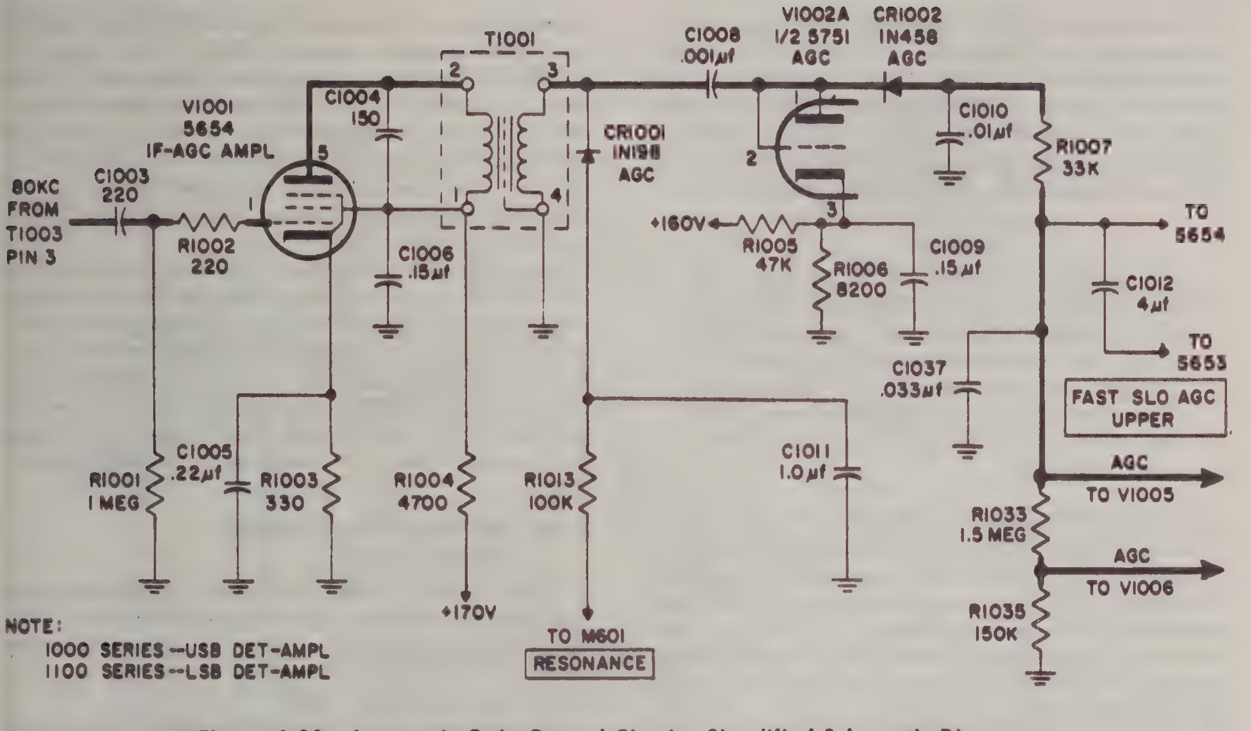

80KC
FROM
T1003
PIN 3
C1003
220
R1002
220
V1001
5654
IF-AGC AMPL
5
1
C1004
150
T1001
2
3
4
C1006
.15µf
CR1001
IN198
AGC
C1008
.001µf
V1002A
1/2 5751
AGC
CR1002
IN458
AGC
C1010
.01µf
R1007
33K
2
3
+160V
R1005
47K
R1006
8200
C1009
.15µf
TO
5654
C1012
4µf
TO
5653
FAST SLO AGC
UPPER
C1037
.033µf
C1011
1.0µf
AGC
TO V1005
R1033
1.5 MEG
AGC
TO V1006
R1035
150K
R1001
1 MEG
C1005
.22µf
R1003
330
R1004
4700
R1013
100K
+170V
TO M601
RESONANCE
NOTE:
1000 SERIES--USB DET-AMPL
1100 SERIES--LSB DET-AMPL

Figure 4-28. Automatic Gain Control Circuits, Simplified Schematic Diagram

the AGC control circuits of the USB and LSB detector-amplifiers.

V1004 amplifies the 80 kc signal from T1002 and develops an output across plate load resistor R1024. V1004 contains also, in its cathode circuit, GAIN BAL potentiometer R1025, which balances the gain with that of the IF amplifier in the LSB detector-amplifier. The output of V1004 is coupled to IF amplifier V1005 through bandpass filter FL1001.

FL1001 has an operating range of 76 kc to 79.7 kc, which has the false appearance of LSB operation because of the inversion of frequencies in the first frequency conversion. Here the HF oscillator operates at a frequency higher than that of the incoming signal. Since the original USB signal is the sum of the carrier and upper sideband, the mixing process results in a difference frequency that is lower than the 80 kc IF by the modulation components of the original USB signal. The original signal represented a carrier plus a modulation component; the converted signal represents an intermediate frequency minus that component. There is no inversion in the second and third conversions, because their local-oscillator frequencies are lower than the signal frequency; therefore, these conversions do not counteract the inversion of the first stage, and filter FL1001, with a bandwidth of 3.7 kc, is made to pass a band of frequencies covering 79.7 kc minus 3.7 kc. The output of FL1001 is applied to IF amplifier V1005, which develops an output across IF transformer T1003. The output at pin 3 of T1003 is applied to demodulator amplifier V1006 (figure 4-29) and to the AGC circuit (figure 4-28). The latter develops a control voltage which is fed back through isolating resistor R1028 to the grid of V1005 (figure 4-27).

c. AGC CIRCUITS. *(See figure 4-28.)*—The 80 kc signal from T1003 (plate load of V1005) is applied to IF AGC amplifier V1001 through capacitor C1003. The output of V1001 is developed across transformer T1001 and applied directly to diode CR1001 and through capacitor C1008 to diodes V1002A and CR1002.

During the negative portion of the input signal (at pin 3 of T1001), CR1001 passes current through resistor R1013 and RESONANCE meter M601 to ground. This negative signal is altered by capacitor C1011.

One output of V1002A and CR1002 is applied through A.G.C. UPPER switch S654 and S657 to V51 and V101 of the preselector.

A second output of V1002A and CR1002 provides cascade voltage doubling for delayed AGC in V1005 (par. 4-9*b*) and V1006 (par. 4-9*d*), the amount of delay depending on the positive bias voltage applied to the cathode of V1002A. When received signals are weak, no AGC voltage is developed, and the receiver is in its most sensitive state. On strong inputs, the bias voltage at V1002A is nullified and the AGC voltage doubler activated. During the positive half-cycle of a strong input, V1002A charges capacitor C1008 to the peak value of the input signal. On the negative halfcycle, the voltage across C1008 is in series with the negative voltage at the secondary of T1001 and the sum voltage is impressed on CR1002, charging capacitor C1010 to the sum voltage (double the peak value of the input signal).

The voltage across C1010 is applied to V51 and V101 of the preselector, to V1005, and to V1006. AGC reaction time is fast (C1010) or slow (C1012), depending on the position of A.G.C. UPPER SLOW/FAST switch S653 on the lower demodulator panel. For SSB operation, both capacitors charge quickly for fast attack and discharge slowly through resistors R1033 and R1035.

Note

> Figure 4-28 is the schematic diagram for the AGC circuits of both the USB and LSB detector amplifiers. These circuits are identical except for symbol reference designations. Numbers on the figures in the 1000 series refer to the upper sideband; those in the 1100 series refer to the lower. Both series are shown on the diagram.

d. DEMODULATOR AMPLIFIER V1006, BALANCED-RING DEMODULATOR.*(See figure 4-29.)*—Demodulator amplifier V1006 receives its signal from IF amplifier V1005 by way of transformer T1003 and capacitor C1029. The plate load of V1006 is in balanced-ring demodulator Z1001, which, in addition, detects the USB IF signal. A second input to Z1001 is the 80 kc carrier from carrier amplifier stage V1104 of the lower-sideband detector-amplifier. Combining the two inputs in Z1001 results in outputs containing original frequency and difference frequency components. Z1001 by-passes all but the difference frequency and applies it to audio amplifier V1007 by way of A.F. LEVEL LINE A potentiometer R651.

e. AUDIO AMPLIFIERS V1007 and V1008. *(See figure 4-30.)*—Audio amplifier V1007 and V1008 are audio output stages. The level of input to V1007 is controlled by R651, and the amplified output of V1007 is developed across plate load resistor R1043 and applied to V1008 through capacitor C1036. The output of V1008 is developed across output transformer T1004, which is common to the USB and AM detector-amplifiers. Only one of these sections operates at a time, the selection being made by the RECEPTION A.M./S.S.B. switch on the lower demodulator panel. T1004 has two secondary, or output, windings, one to LINE A OUT, the other to LINE A PHONES.

Both audio amplifiers have negative feedback. That of V1007 is from the plate circuit of V1008 through filter network R1040, C1032, and R1041, plus another feedback from its unbypassed cathode resistor (also R1041). In addition, R1041 is part of a voltage-divider network (with R1039) between B+ and ground, which supplies V1007 with a fixed bias voltage. V1008 gets its feedback from its unbypassed cathode resistor, R1046.

4-10. LSB DETECTOR-AMPLIFIER

(See figure 4-31.)

a. GENERAL.—Tubes V1105 and V1106 comprise a two-stage IF amplifier receiving an 80 kc input from the USB detector-amplifier. It has two amplified 80 kc outputs, one to IF-AGC amplifier V1101, the other to demodulator amplifier V1107.

The output of V1101 is applied to diode CR1101 and AGC diodes CR1101-V1102A. The rectified voltage from CR1101 is applied through R1113 to resonance meter M601. CR1102-V1102A has two outputs. One is fed back to provide gain control for V1106 and V1107. The other is applied through S656 and S657 to the RF amplifiers in the preselector section.

The output of V1107 is applied to balanced-ring demodulator Z1101, where it is mixed with an 80 kc carrier signal from the synthesizer section by way of carrier amplifier V1104. The difference between the 80

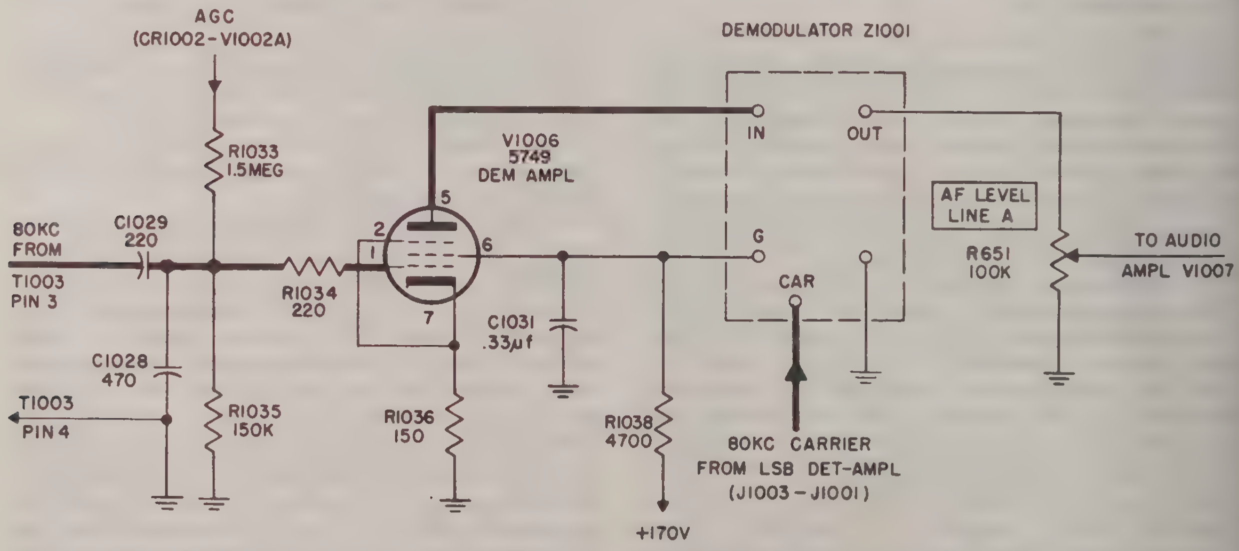


Figure 4-29. Demodulator Amplifier V1006 and Balanced-Ring Demodulator Z1001, Simplified Schematic Diagram

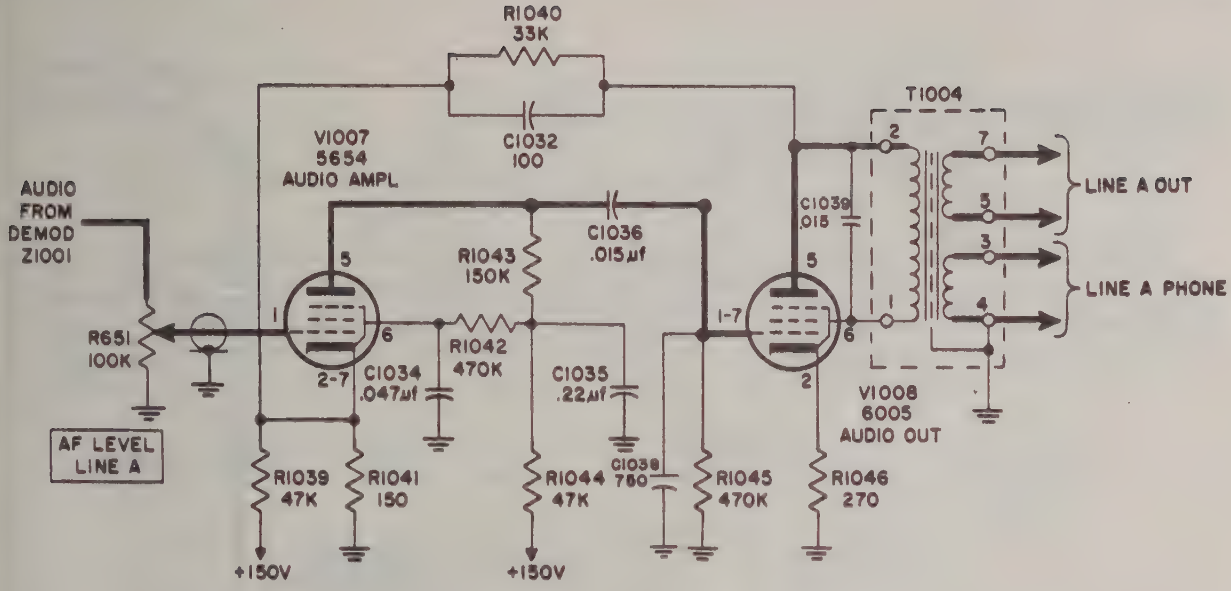


Figure 4-30. Audio Amplifiers V1007 and V1008, Simplified Schematic Diagram

kc carrier and 80 kc IF signal is the audio frequency which is amplified by V1108 and V1109 applied to LINE B OUT connector J1803 and LINE B PHONE connector J652.

b. IF AMPLIFIER V1105-1106. *(See figure 4-32.)*—The control grid of V1105 receives its 80 kc input from the USB detector-amplifier through connector J1103. The amplified output is developed across plate load resistor R1127 and applied through coupling capacitor C1122 to bandpass filter FL1101, which has an operating bandwidth of 80.3 kc to 84 kc.

As in the case of USB bandpass filter FL1001 (see par. 4-9*b*), the operating range of FL1101 suggests a contradiction, as if it were in the upper instead of the lower sideband. Again, the condition results from inversion in the first three frequency conversions. Here the difference between the HF local oscillator signal and the incoming LSB signal is an 80 kc IF carrier plus the modulating component, which remains inverted after two more frequency conversions. The result is that the range of FL1101 is 3.7 kc above the 80 kc carrier frequency of the LSB IF amplifier. Similarly, GAIN BAL potentiometer R1128 serves the same purpose in varying the bias on tube V1105 as R1025 does for V1004 in the USB IF amplifier (see par. 4-9*b*). Screw-type adjustments permit both amplifiers to provide essentially the same output level.

The output of FL1101 is applied through coupling capacitor C1127 to IF amplifier V1106, the amplified output of which is developed across IF transformer T1102 and fed to demodulator amplifier V1107 (figure 4-34) and the AGC circuit (figure 4-28). The gain of V1106 is governed manually, by the R.F. GAIN control on the lower converter panel, and automatically, by the negative voltage developed by the AGC circuits of the LSB detector-amplifier.

c. LSB DETECTOR-AMPLIFIER AGC CIRCUITS. *(See figure 4-28.)*—The operation of the AGC circuits of the USB and LSB detector-amplifiers is identical. Refer to sub-paragraph 4-9*c* for a discussion of both. Figure 4-28 is a schematic diagram of both circuits. Symbol reference designations in the 1000 series refer to the USB circuits; those in the 1100 series refer to the lower sideband.

d. CARRIER AMPLIFIER V1104. *(See figure 4-33.)*—Carrier Amplifier V1104 is a dual-triode tube, the paralleled grids of which receive their 80 kc input from the synthetizer section via J1102 and C1116. The amplified output of triode A is developed across plate load resistor R1120 and applied via capacitor C1119 to CAR terminal of balanced ring demodulator Z1101 of the LSB detector-amplifier. The amplified output of triode B is developed across plate load resistor R1116 and applied to balanced-ring demodulator Z1001 of the USB detector-amplifier by way of coupling capacitor C1115 and connectors J1101 and J1003.

e. DEMODULATOR AMPLIFIER V1107, BALANCED-RING DEMODULATOR Z1101. *(See figure 4-34.)*—Demodulator amplifier V1107 receives its input signal from IF amplifier V1106 (T1102) through capacitor C1130. The plate load impedance of V1107 is in demodulator Z1101, which in addition detects the LSB IF signal. A second input to Z1101 is the 80 kc inserted carrier from carrier amplifier V1104. When Z1101 receives no IF signal at its IN terminal it has no output, but when there is an IF input at IN, the combination of IF signal and 80 kc carrier results in output

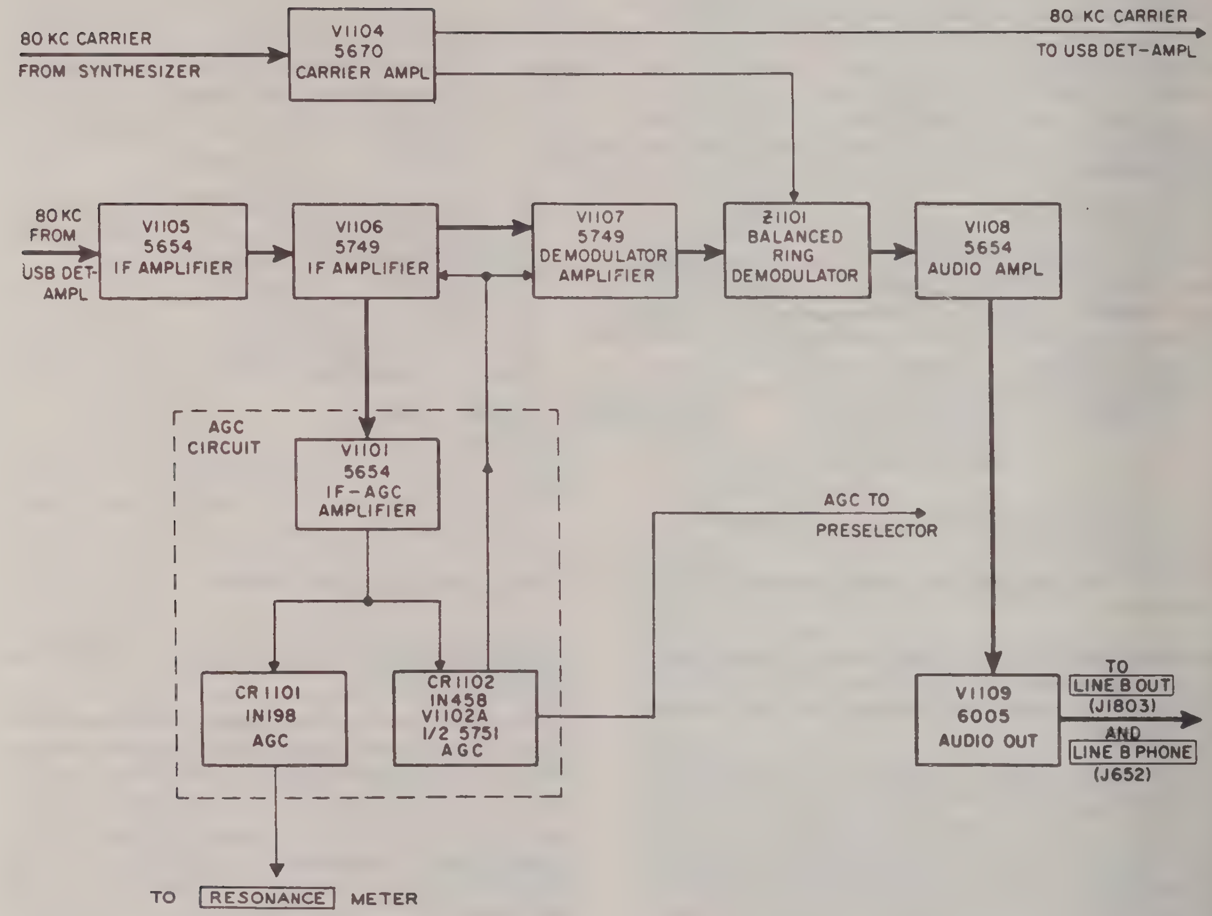

80 KC CARRIER
FROM SYNTHESIZER
V1104
5670
CARRIER AMPL
80 KC CARRIER
TO USB DET-AMPL
80 KC
FROM
USB DET-AMPL
V1105
5654
IF AMPLIFIER
V1106
5749
IF AMPLIFIER
V1107
5749
DEMODULATOR
AMPLIFIER
Z1101
BALANCED
RING
DEMODULATOR
V1108
5654
AUDIO AMPL
AGC
CIRCUIT
V1101
5654
IF-AGC
AMPLIFIER
AGC TO
PRESELECTOR
CR1101
IN198
AGC
CR1102
IN458
V1102A
1/2 5751
AGC
V1109
6005
AUDIO OUT
TO
LINE B OUT
(J1803)
AND
LINE B PHONE
(J652)
TO
RESONANCE
METER

Figure 4-31. LSB Detector-Amplifier, Block Diagram

signals of sum and difference frequencies. Z1101 bypasses the sum frequencies and applies the difference frequencies to audio amplifier V1108 (figure 4-35) through AF LEVEL LINE B potentiometer R652.

f. AUDIO AMPLIFIERS V1108 AND V1109. *(See figure 4-35.)*—The input audio level selected by AF LEVEL LINE B potentiometer R652 is applied to the control grid of audio amplifier V1108, the output of which is developed across plate load resistor R1146 and applied to audio output amplifier V1109 through capacitor C1137. The output of V1109 is developed across output transformer T1103 which has two secondary or output windings, one to the LINE B OUT jack and the other to the LINE B PHONES jack.

Both amplifiers have negative feedback. That of V1108 is from the plate circuit of V1109 through filter network R1143, C1133, and R1144, plus another feedback from its unbypassed cathode resistor (also R1144). In addition, R1144 is part of voltage-divider network (with R1142) between B+ and ground, which supplies V1108 with a fixed bias. Amplifier V1109 gets its negative feedback from unbypassed cathode resistor R1149.

Figure 4-36 shows how the USB and LSB detector-amplifiers can be connected, singly or jointly, to a voltage-divider network consisting of resistors R1015 and R1017. The selection is made by the ON/OFF switches labeled A.G.C. UPPER (S654) and A.G.C. LOWER (S656) on the lower demodulator panel. If only one of these switches is in ON position, AGC voltage from that sideband only is applied to the divider network. The AGC voltage actually applied to USB IF amplifier V1003 and preselector RF amplifiers V51 and V101 is the voltage across R1017 of the voltage divider network. This AGC voltage is reduced from the total available at TB1001-1 because of the sharp cutoff characteristic of the type 5654 tubes used, and also to prevent front-end gain reduction and the possible loss of weak signals.

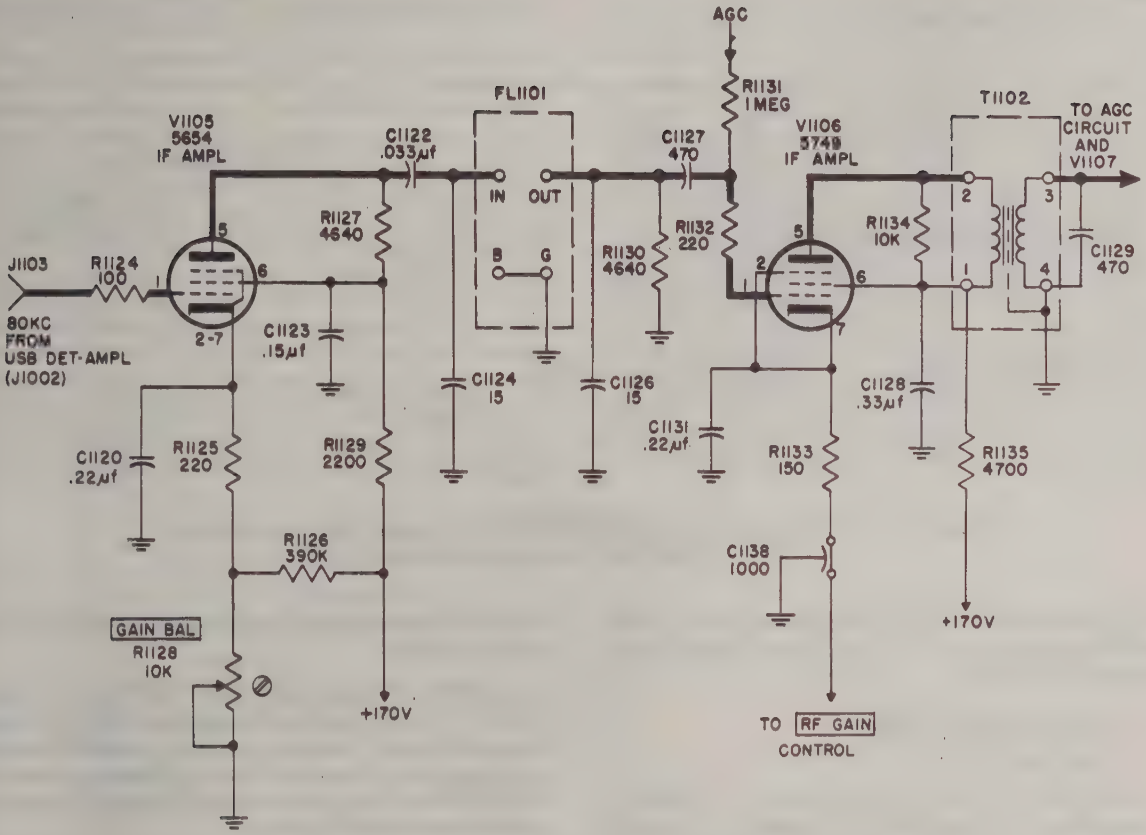

AGC
R1131
1MEG
FL1101
T1102
TO AGC
CIRCUIT
AND
V1107
V1105
5654
IF AMPL
C1122
.033μf
IN
OUT
B
G
C1127
470
V1106
5749
IF AMPL
R1127
4640
R1132
220
R1130
4640
R1134
10K
C1129
470
J1103
R1124
100
80KC
FROM
USB DET-AMPL
(J1002)
5
6
1
2-7
2
7
3
4
C1123
.15μf
C1124
15
C1126
15
C1131
.22μf
C1128
.33μf
C1120
.22μf
R1125
220
R1129
2200
R1133
150
R1135
4700
R1126
390K
C1138
1000
+170V
GAIN BAL
R1128
10K
+170V
TO RF GAIN
CONTROL

Figure 4-32. IF Amplifiers V1105 and V1106, Simplified Schematic Diagram

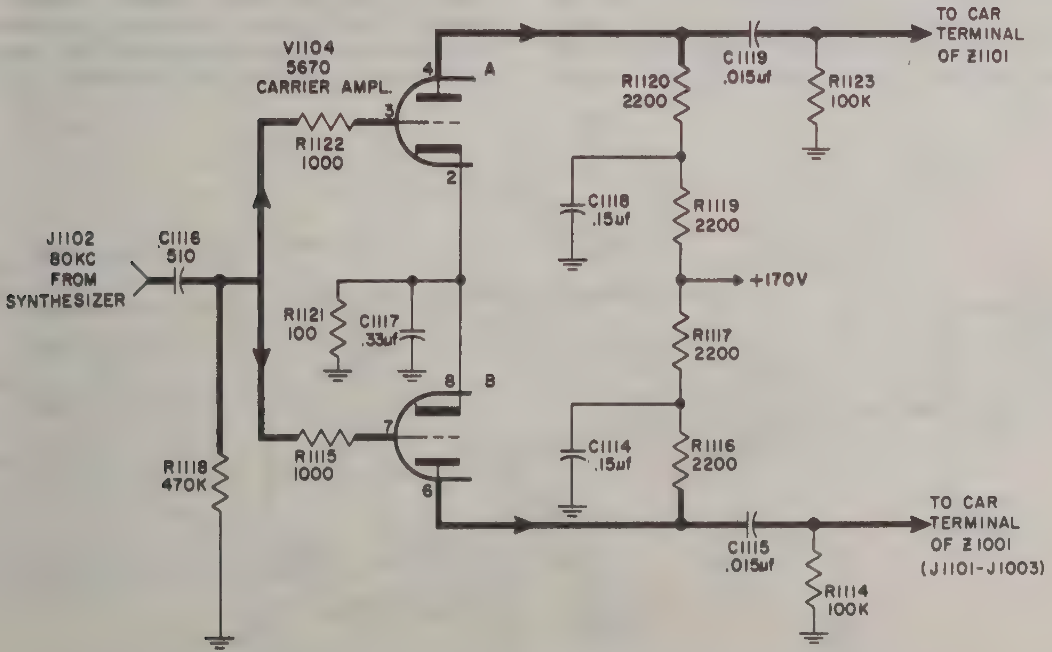

TO CAR
TERMINAL
OF Z1101
V1104
5670
CARRIER AMPL.
4
A
3
2
C1119
.015uf
R1120
2200
R1123
100K
R1122
1000
C1118
.15uf
R1119
2200
J1102
80KC
FROM
SYNTHESIZER
C1116
510
+170V
R1121
100
C1117
.33uf
R1117
2200
8
B
7
6
R1115
1000
C1114
.15uf
R1116
2200
R1118
470K
C1115
.015uf
R1114
100K
TO CAR
TERMINAL
OF Z1001
(J1101-J1003)

Figure 4-33. Carrier Amplifier V1104, Simplified Schematic Diagram

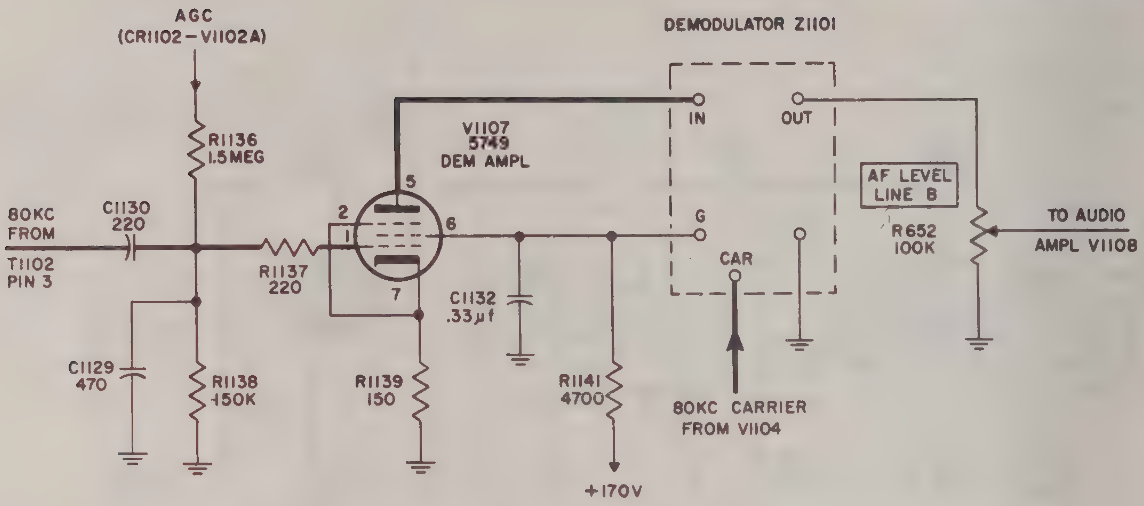

AGC
(CR1102 – V1102A)
DEMODULATOR Z1101
R1136
1.5 MEG
V1107
5749
DEM AMPL
IN
OUT
AF LEVEL
LINE B
80KC
FROM
T1102
PIN 3
C1130
220
R1137
220
G
CAR
R652
100K
TO AUDIO
AMPL V1108
C1132
.33μf
C1129
470
R1138
150K
R1139
150
R1141
4700
80KC CARRIER
FROM V1104
+170V
5
2
1
6
7

Figure 4-34. Demodulator Amplifier V1107 and Balanced-Ring Demodulator Z1101, Simplified Schematic Diagram

With both switches ON during simultaneous USB and LSB reception, AGC voltages from both units are applied to the divider.

4-11. CRYSTAL OSCILLATOR.

(See figure 4-37.)

The crystal oscillator section generates the standard 1 mc frequency for operation of the spectrum generator and frequency dividers. The stability of the receiver is related directly to that of the oscillator (1 part in 10^7). The crystal oscillator section consists of three major circuits—the oven oscillator-amplifier, the crystal oscillator-amplifier, and the frequency dividers. Figure 4-37 shows the functional relationship of these circuits, each of which is discussed in signal sequence in the following subparagraphs.

a. OVEN OSCILLATOR-AMPLIFIER. *(See figure 4-38.)*—The oven oscillator-amplifier circuit is a fixed-frequency audio amplifier with a positive feedback which produces circuit oscillation. Power produced by the oscillator is applied to the heating elements of crystal oven assembly A701.

The temperature of the crystal oven is controlled by the proportional method, which is continuous, as opposed to the thermostatic, which is marked by step effects. When the desired temperature is reached, bridge arms come into balance and provide only enough feedback signal to maintain that temperature. A deviation

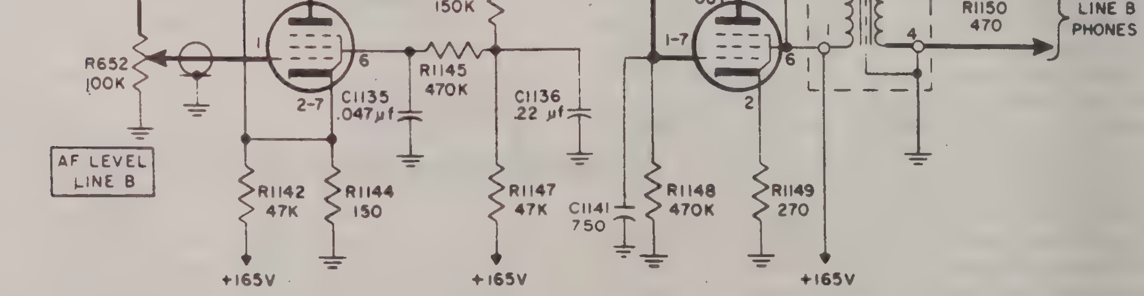

R1143
33K
T1103
V1108
5654
AUDIO AMPL
C1133
100
AUDIO
FROM
DEMOD
Z1101
C1137
.015μf
R1146
150K
V1109
6005
AUDIO
OUT
C1140
.015
LINE B
OUT
LINE B
PHONES
R1150
470
R652
100K
R1145
470K
C1135
.047μf
C1136
.22 μf
1-7
AF LEVEL
LINE B
R1142
47K
R1144
150
R1147
47K
C1141
750
R1148
470K
R1149
270
+165V
+165V
+165V
5
1
6
2-7
5
6
2
2
7
5
3
4

Figure 4-35. Audio Amplifiers V1108 and V1109, Simplified Schematic Diagram

in temperature will cause an imbalance and subsequent correction. The procedure is as follows:

Tube V701 operates as the oscillator stage. Its plate-tuned circuit is the result of L701 and C703 determining the oscillation frequency. When the circuit is energized, a positive feedback signal from the oven heaters is applied to the grid of V701 (pin 1), producing oscillations about 2 kc. Tube V702 is an amplifier stage which isolates the oscillator from the driver stage. The buffer output signal developed at R708 is applied through coupling capacitor C708 and grid resistor R710 to driver V703. Output transformer T701 couples the output power of V703 to the heating elements of the oven assembly. There are four of these elements, forming a bridge circuit. Two terminals of the four-terminal bridge connect to the output of T701; the other two provide an output signal proportional to oven temperature. This signal is fed back to V701 with polarity suited to produce oscillation. The size of the feedback voltage determines the level of heater power (and oven temperature).

In case of failure of the heater control circuit, contents of the oven are protected against overheating by a thermo switch connected across the heater terminals. Its contacts are normally open; when closed they divert heater power.

Capacitor C711 couples the output signal of the driver to voltage-divider resistors R713 and R714. The signal reduced at the junction of the resistors, is applied to diode CR701, which operates the PHASE OR TEMP meter through multiplier resistor R715. Capacitor C714 by-passes the ripple component around the meter, which measures signal level at the output of V703. Since this level is linked to oven temperature, it provides an accurate measure of that temperature.

The 1 mc crystal and related components mounted in

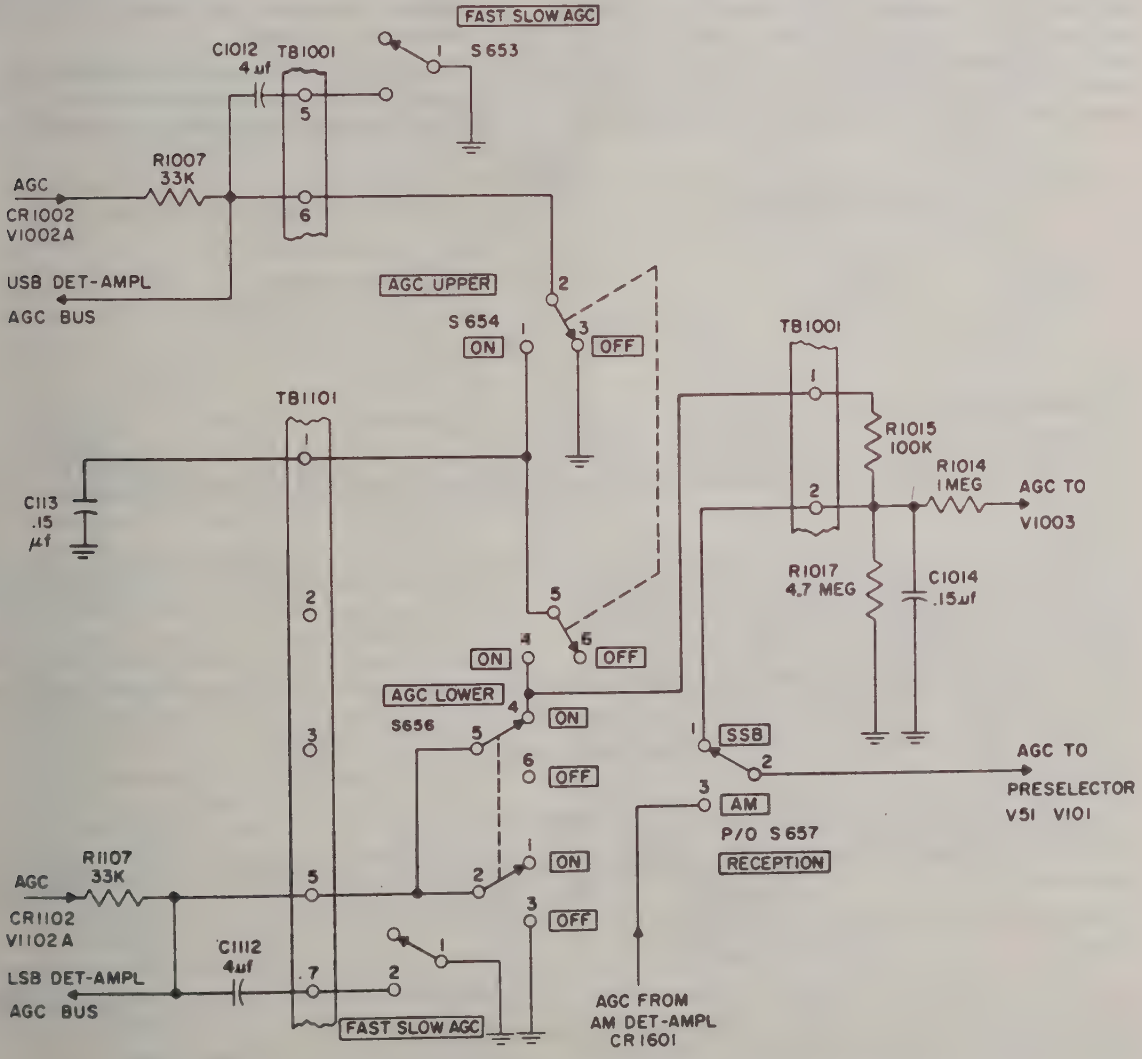

FAST SLOW AGC
C1012 4 μf
TB1001
1
S653
5
R1007 33K
AGC
CR1002
V1002A
6
USB DET-AMPL
AGC BUS
AGC UPPER
2
S654
1
3
ON
OFF
TB1001
1
TB1101
1
R1015 100K
R1014 1MEG
2
AGC TO V1003
C113 .15 μf
R1017 4.7 MEG
C1014 .15μf
2
5
6
ON
OFF
4
AGC LOWER
4
ON
S656
5
3
1
SSB
6
OFF
2
AGC TO PRESELECTOR V51 V101
3
AM
P/O S657
RECEPTION
1
ON
R1107 33K
AGC
5
2
CR1102
V1102A
3
OFF
C1112 4μf
1
LSB DET-AMPL
AGC BUS
7
2
FAST SLOW AGC
AGC FROM AM DET-AMPL CR1601

Figure 4-36. USB and LSB AGC Interconnections, Simplified Schematic Diagram

the oven are also parts of the oven assembly but not functional parts of the oven oscillator-amplifier circuit; therefore they have been omitted from figure 4-38. The complete oven is mounted in a Dewar flask similar to a vacuum bottle. The flask is protected against shock by a fiberglas blanket and mounted in a steel container. This assembly is a single unit; components cannot be removed for individual repair or replacement.

b. CRYSTAL OSCILLATOR-AMPLIFIER. *(See figure 4-39.)*—The crystal oscillator-amplifier circuit produces the standard 1 mc frequency from which, through division, the 100 kc output of the crystal oscillator section is derived. It consists of crystal oscillator V704, 1 mc amplifier V705, and buffer V706.

The oscillator is a Pierce type, and its 1 mc basic frequency is determined by crystal Y1, connected from the plate to the grid of the oscillator through blocking capacitor C1. Tuning capacitor C719 permits small adjustments in oscillator frequency to conform to an external primary standard. V705 follows the oscillator and amplifies the 1 mc signal. Plate inductance L704 is tuned to 1 mc and is the tank circuit for the amplifier. Buffer V706 provides further signal amplification and isolates the oscillator circuits from the frequency-divider section which follows. The output of V706 is developed in its cathode circuit and is applied to the frequency divider through S701.

The 1 mc amplifier includes an amplitude-control circuit to provide an unvarying 1 mc signal. Diode CR702 receives a portion of the signal from the plate circuit of V705 through coupling capacitor C723. Besides the 1 mc signal, a dc bias of reverse polarity is applied to CR702 from the receiver power supply through a voltage-divider network consisting of R724 and R729. If the dc bias prevents diode conduction, C723 supplies the 1 mc signal to the grid of V704 through resistors R716 and R719. The phase of this feedback promotes oscillation. When the signal from V705 exceeds the blocking bias, CR702 conducts, applying a rectified voltage, produced at load resistor R725, as a negative bias to the grid of V704, reducing the 1 mc signal level. Balance is maintained between the 1 mc signal feedback and the rectified voltage of CR702, and the balance keeps the 1 mc signal amplitude constant at the output of V706.

When a signal from an external standard is applied at connector J709, it combines with the 1 mc crystal oscillator signal at the junction of coupling capacitors

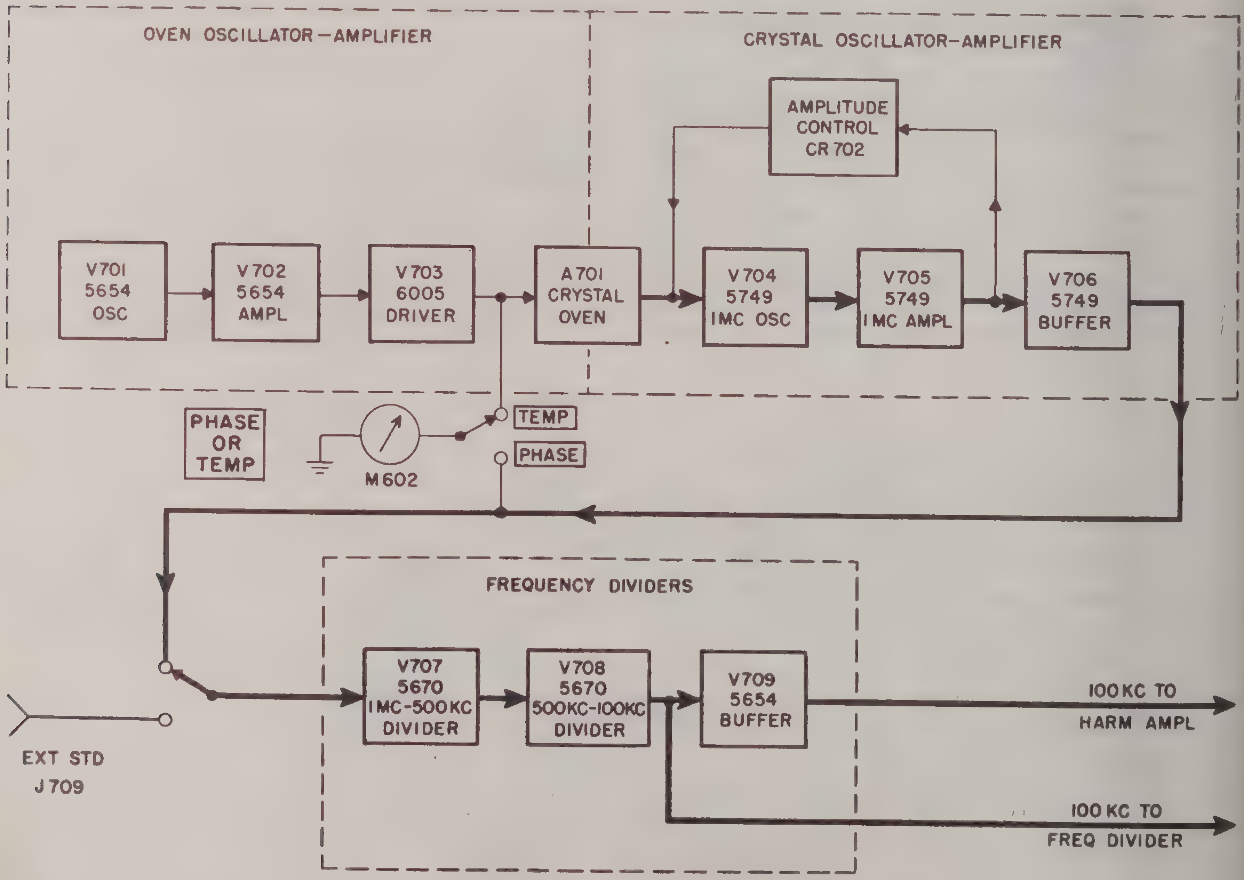
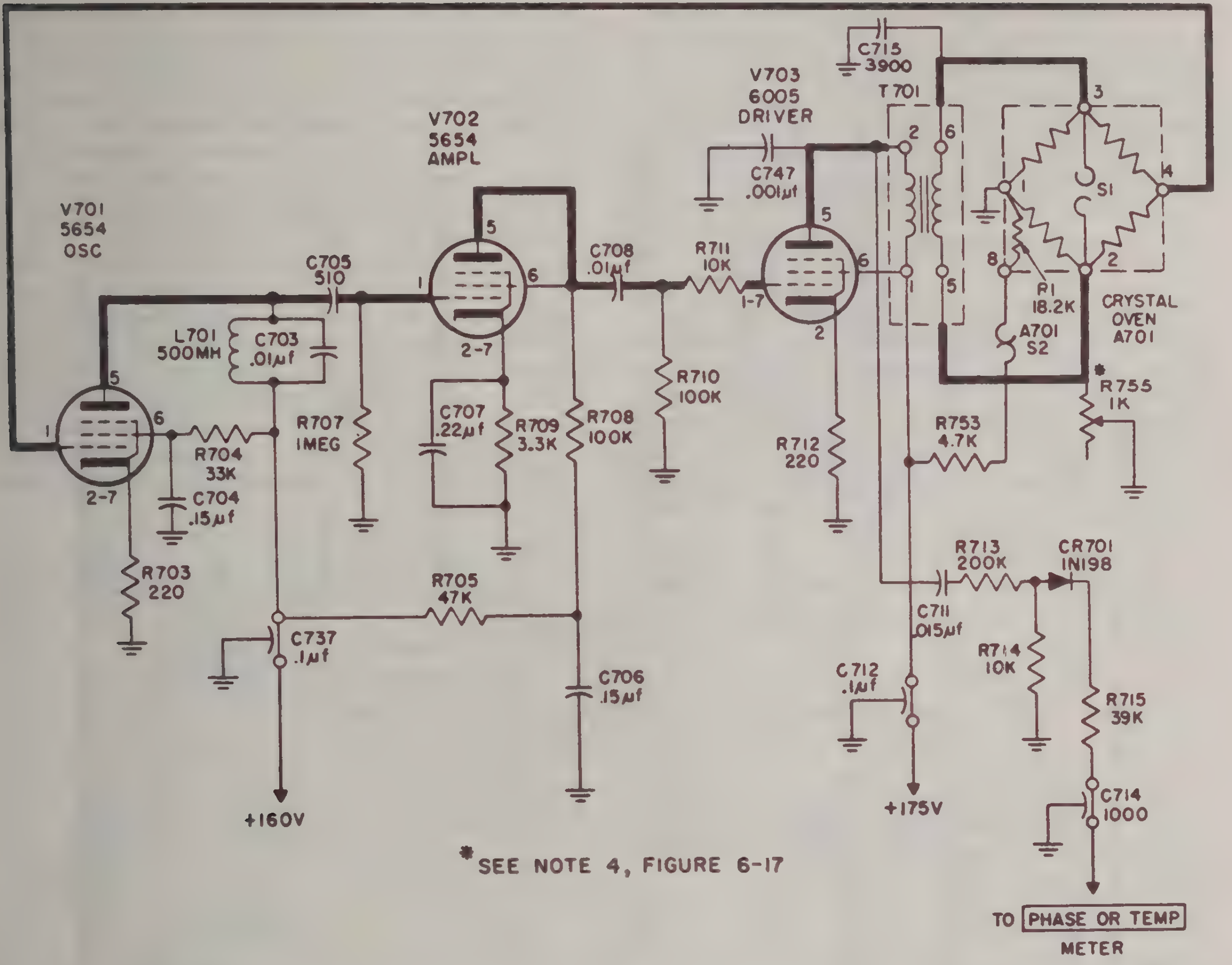

OVEN OSCILLATOR—AMPLIFIER
CRYSTAL OSCILLATOR—AMPLIFIER
AMPLITUDE CONTROL CR702
V701 5654 OSC
V702 5654 AMPL
V703 6005 DRIVER
A701 CRYSTAL OVEN
V704 5749 IMC OSC
V705 5749 IMC AMPL
V706 5749 BUFFER
PHASE OR TEMP
M602
TEMP
PHASE
FREQUENCY DIVIDERS
V707 5670 IMC-500KC DIVIDER
V708 5670 500KC-100KC DIVIDER
V709 5654 BUFFER
100KC TO HARM AMPL
100KC TO FREQ DIVIDER
EXT STD J709

Figure 4-37. Crystal Oscillator, Block Diagram


V701
5654
OSC
V702
5654
AMPL
V703
6005
DRIVER
C715
3900
T701
C747
.001μf
C705
510
C708
.01μf
R711
10K
1-7
L701
500MH
C703
.01μf
2-7
C707
.22μf
R709
3.3K
R708
100K
R710
100K
R712
220
R753
4.7K
R707
1MEG
R704
33K
C704
.15μf
R703
220
R705
47K
C737
.1μf
C706
.15μf
+160V
S1
R1
18.2K
A701
S2
CRYSTAL
OVEN
A701
R755
1K
R713
200K
CR701
1N198
C711
.015μf
C712
.1μf
R714
10K
R715
39K
C714
1000
+175V
TO PHASE OR TEMP
METER

*SEE NOTE 4, FIGURE 6-17

Figure 4-38. Oven Oscillator-Amplifier, Simplified Schematic Diagram

C728 and C730. If the two signals are of identical frequency and phase, the PHASE OR TEMP meter (reading PHASE) will produce a steady reading; if they differ in frequency, the resultant phase difference will cause the meter reading to fluctuate at a rate determined by the frequency difference or beat between the signals. When standardizing the crystal oscillator, adjust capacitor C719 for a steady meter reading. The coincidence of the two signals is measured by timed observations of the meter fluctuation in response to the beat frequency.

The foregoing applies with FREQ. STANDARD switch S701 in INT. STD. position. Placing the switch in EXT. STD. permits an external standard to be used in place of the crystal oscillator-amplifier section by cutting the frequency-divider circuits from V705 and V706 and connecting them directly to J709.

c. FREQUENCY DIVIDERS V707 and V708, BUFFER V709. *(See figure 4-40.)*—The frequency dividers derive a 100 kc signal from the 1 mc input from the crystal oscillator-amplifier circuit. V707 makes the first division to 500 kc, and V708 the second division to 100 kc. V707 is a locked-oscillator with a tuned circuit, L705 and C736, at its output grid (pin 7) tuned to 500 kc. V708 has a similar circuit, L706, tuned by capacitors C740 and C741 to 100 kc. These capacitors serve also as a signal divider supplying buffer amplifier V709. The buffer amplifies the 100 kc signal and applies it to the harmonic amplifier section by way of output connector J707. It also isolates the frequency divider section from the harmonic amplifier. L707 in the plate circuit of V709 is tuned to 100 kc. Output connector J705 provides a 100 kc signal for the frequency divider section and J707 a 100 kc signal for the harmonic amplifier input.

4-12. HARMONIC AMPLIFIER AND MIXER.

(See figure 4-41.)

The harmonic amplifier and mixer produce a 100 kc spectrum from the frequency range of 2.9 mc to 32.9 mc when driven by the 100 kc signal from the crystal oscillator section. Basically, the harmonic amplifier and mixer section consist of a harmonic generator, tuned

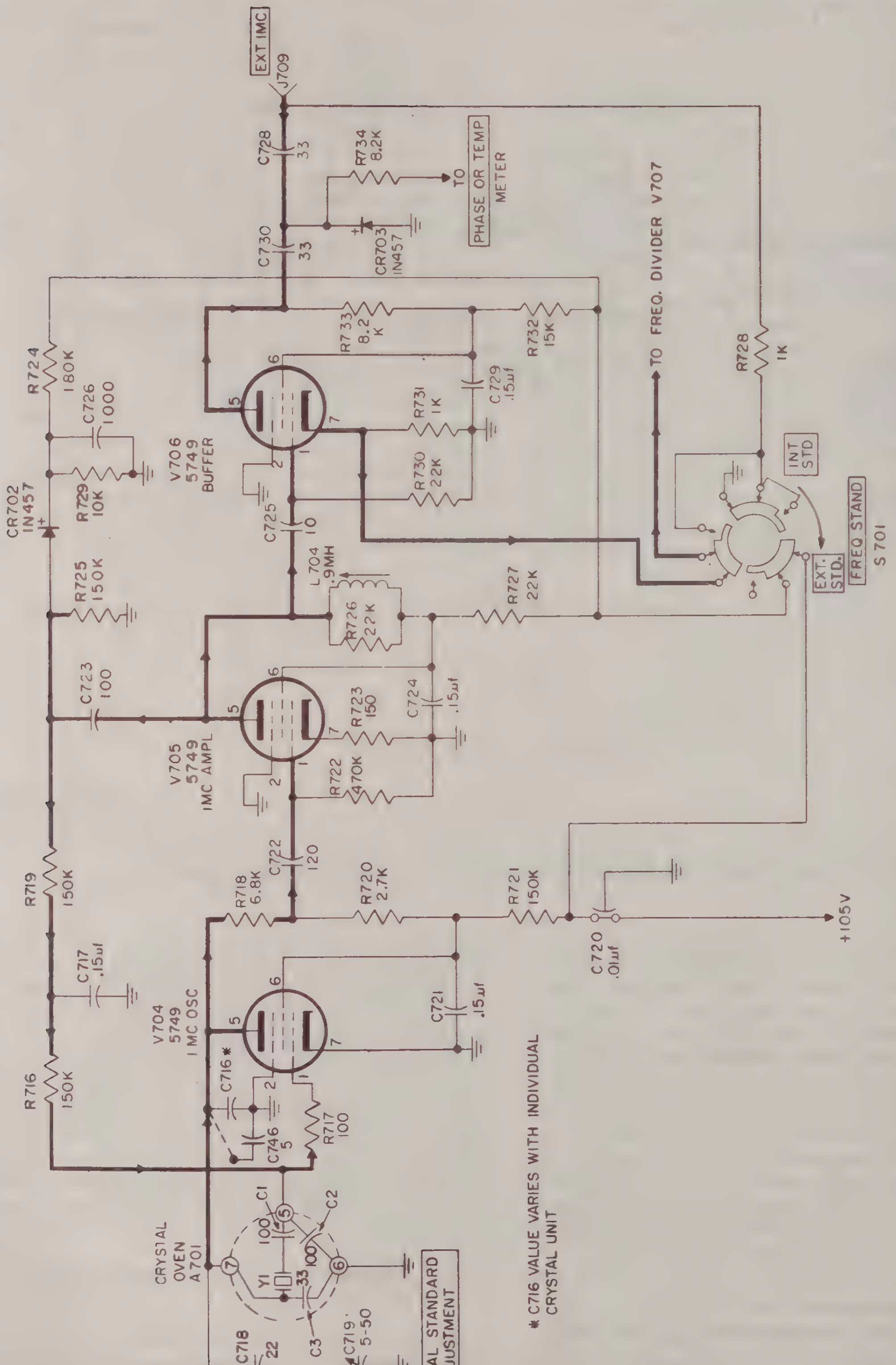

EXT IMC
J709
C728
33
R734
8.2K
TO
PHASE OR TEMP
METER
C730
33
CR703
IN457
TO FREQ. DIVIDER V707
R733
8.2
K
R732
15K
R728
1K
R724
180K
C726
1000
V706
5749
BUFFER
C729
.15uf
R731
1K
R730
22K
C725
10
R729
10K
CR702
IN457
INT
STD
FREQ STAND
S 701
EXT.
STD.
L 704
.9MH
R726
22K
R727
22K
R725
150K
C723
100
V705
5749
IMC AMPL
R723
150
C724
.15uf
R722
470K
C722
120
R719
150K
R718
6.8K
R720
2.7K
R721
150K
C720
.01uf
+105V
C717
.15uf
V704
5749
I MC OSC
C721
.15uf
R716
150K
C716*
C746
5
R717
100
C1
C2
100
100
CRYSTAL
OVEN
A701
Y1
33
C3
C718
22
C719
5-50
INTERNAL STANDARD
ADJUSTMENT
* C716 VALUE VARIES WITH INDIVIDUAL
CRYSTAL UNIT

Figure 4-39. Crystal Oscillator-Amplifier, Simplified Schematic Diagram

amplifier stages, and an output mixer. The mixer combines the generated spectrum with a signal from the high-frequency oscillator for incremental tuning at 100 kc intervals. The tuning controls of the HF oscillator and harmonic amplifier and mixer sections are ganged for simultaneous operation.

As shown in figure 4-41, the 100 kc signal from the crystal oscillator section is applied to harmonic generator diode CR201 through connectors J707 and J201 and resistor R201. The signal-clipping action of CR201 provides the control grid (pin 1) of harmonic amplifier V201 with a wide range of harmonics from the 100 kc input signal. The operating frequency is selected by the tank circuit in the plate of V201. This tank circuit is tuned simultaneously with the tuned circuits of the HF oscillator section. The functional relationship between these sections is explained in the subparagraph on incremental tuning (4-1*f*). The output of V201 is applied to a second harmonic amplifier (V202) where again the signal amplitude is increased and applied to mixer V251 (pin 1). Mixer V251 combines this selected harmonic signal with a signal from the HF oscillator applied at jack J301. These two signals are mixed and produce a difference frequency of 825 kc which is available at output connector J252. The plate load of V251 is physically located in the injection IF amplifier section.

4-13. HIGH-FREQUENCY OSCILLATOR V301.
(See figure 4-42.)

High-frequency oscillator (HFO) V301 covers a frequency range of 3.725 mc to 33.725 mc in four bands. Its outputs are used in the preselector for the first frequency conversion and in the harmonic mixer for the 825 kc signal used by the injection IF amplifier section. The schematic diagram shows the HFO as it appears in band 1 operation (2.0 mc to 4.0 mc). The HFO is a

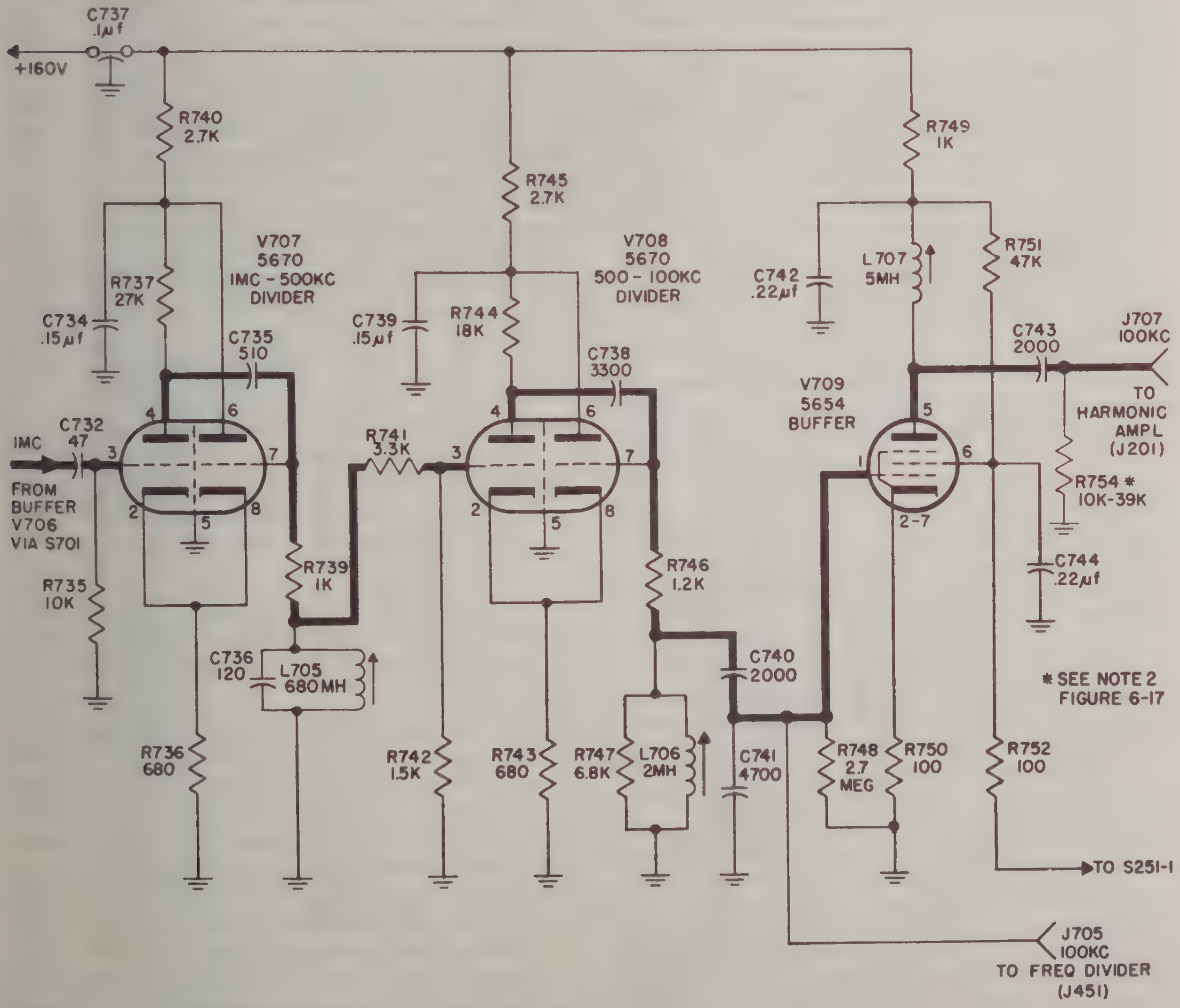
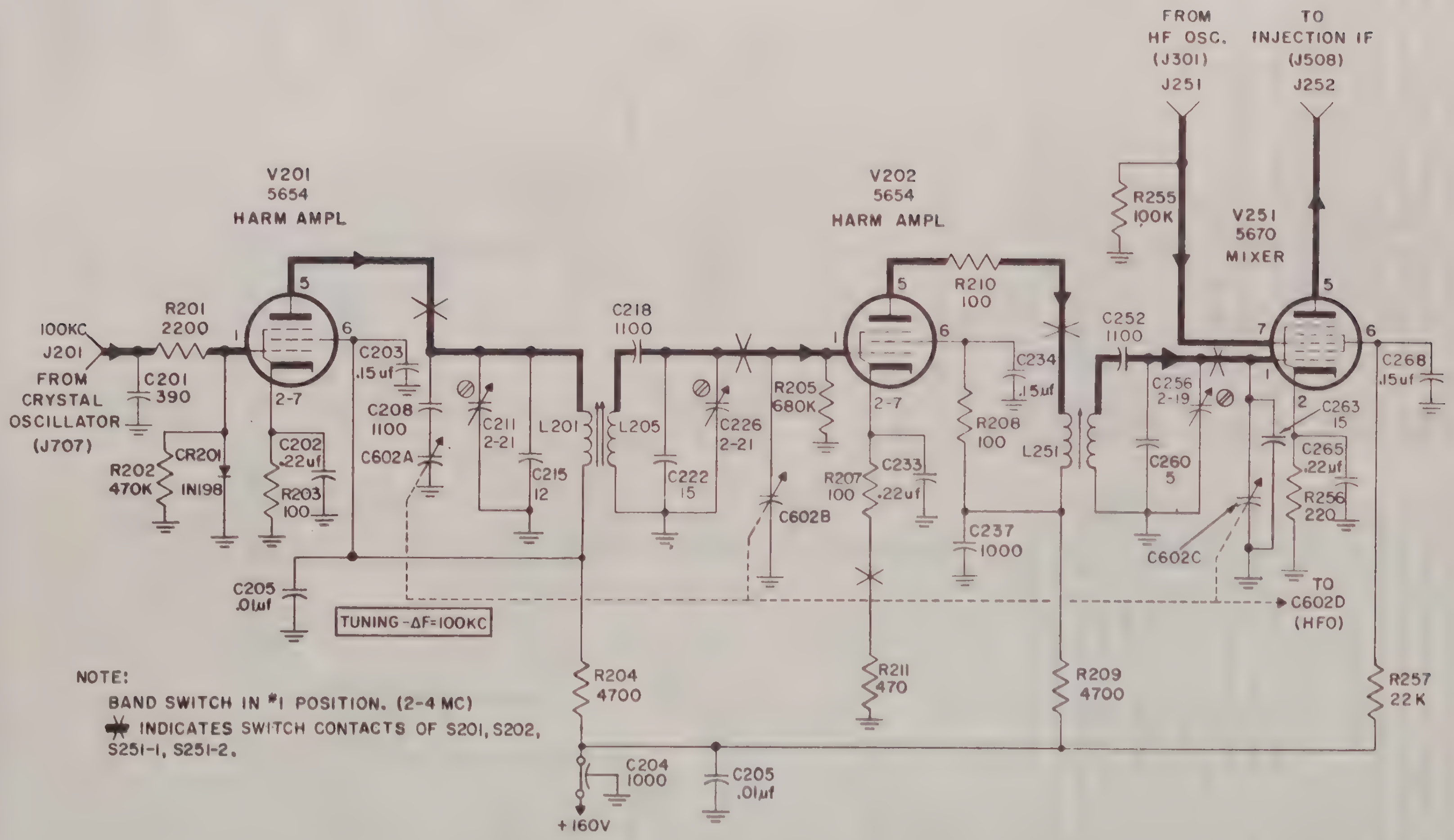

C737
.1μf
+160V
R740
2.7K
R745
2.7K
R749
1K
V707
5670
1MC - 500KC
DIVIDER
V708
5670
500 - 100KC
DIVIDER
R737
27K
C734
.15μf
C735
510
C739
.15μf
R744
18K
C738
3300
C742
.22μf
L707
5MH
R751
47K
C743
2000
J707
100KC
TO
HARMONIC
AMPL
(J201)
V709
5654
BUFFER
C732
47
1MC
FROM
BUFFER
V706
VIA S701
R741
3.3K
R754 *
10K-39K
R735
10K
R739
1K
R746
1.2K
C744
.22μf
C736
120
L705
680MH
C740
2000
* SEE NOTE 2
FIGURE 6-17
R736
680
R742
1.5K
R743
680
R747
6.8K
L706
2MH
C741
4700
R748
2.7
MEG
R750
100
R752
100
TO S251-1
J705
100KC
TO FREQ DIVIDER
(J451)

Figure 4-40. Frequency Dividers V707 and V708 and Buffer V709, Simplified Schematic Diagram


100KC
J201
FROM
CRYSTAL
OSCILLATOR
(J707)
R201
2200
C201
390
R202
470K
CR201
IN198
V201
5654
HARM AMPL
5
1
6
2-7
C202
.22uf
R203
100
C203
.15uf
C208
1100
C602A
C205
.01uf
TUNING-ΔF=100KC
C211
2-21
C215
12
L201
R204
4700
C204
1000
+160V
C205
.01µf
C218
1100
L205
C222
15
C226
2-21
C602B
R205
680K
V202
5654
HARM AMPL
5
1
6
2-7
R207
100
C233
.22uf
R211
470
R210
100
C234
.15µf
R208
100
C237
1000
L251
R209
4700
FROM
HF OSC.
(J301)
J251
R255
100K
TO
INJECTION IF
(J508)
J252
V251
5670
MIXER
5
7
6
1
2
C252
1100
C256
2-19
C260
5
C602C
C263
15
C265
.22µf
R256
220
TO
C602D
(HFO)
C268
.15uf
R257
22K

NOTE:

BAND SWITCH IN #1 POSITION. (2-4 MC)

✱ INDICATES SWITCH CONTACTS OF S201, S202, S251-1, S251-2.

Figure 4-41. Harmonic Amplifier and Mixer, Simplified Schematic Diagram

modified grid-tuned Armstrong circuit with cathode feedback. Coil L301 includes both the tuned-grid and feedback windings. Connector J301 provides an output to harmonic mixer V251 via connector J251, and connector J302 provides an oscillator output to the preselector mixer (V151) via connector J153.

4-14. INTERPOLATION OSCILLATOR V401.

(See figure 4-43.)

Interpolation oscillator V401 produces frequencies in the 580 kc to 680 kc range. These are applied to the injection IF amplifier and the synthesizer sections. The synthesizer receives its signal through the TUNING switch located on the crystal oscillator. V401 is triode connected and operates in a grid-tuned Armstrong circuit. Positive feedback is obtained through L401. Coil L402 is also part of the oscillator tank circuit but is not inductively coupled to the plate coil.

Two oscillator output connectors, J401 and J402, supply the oscillator signal to the injection IF and synthesizer sections, respectively. The signal level is reduced at the connectors by capacitors arranged to form a divider. Capacitors C410 and C411 reduce the signal level at connector J401 by a factor about 125 in direct ratio to the reactance of the two capacitors. Capacitors C413 and C414 reduce the signal level at connector J402 in a similar manner. Resistors R405 and R406 provide dc return paths for the external circuits connected at output connectors J401 and J402. The signal-reducing dividers also provide a degree of circuit isolation between the two output connectors.

4-15. FREQUENCY DIVIDER.

(See figure 4-44.)

This section produces frequency division from 100 kc to 20 kc. The 100 kc input signal is supplied by the frequency-dividing circuit in the crystal oscillator section, and the 20 kc output signal is applied to the synthesizer section for further division and other circuit applications.

Amplifier V451 receives its 100 kc input through connector J451 and coupling capacitor C451. It develops an output across the tuned plate circuit, consisting of L451 and C453.

The amplified 100 kc developed across the tuned plate circuit is coupled to the 20 kc divider stage through capacitor C457. Tubes V452 and V453 form a locked oscillator similar to those in the crystal oscillator frequency divider. The output circuit of L452, C460, and C461 is tuned to 20 kc by the series combination of C462 and C463. Capacitor C461 is an adjustment trimmer. The two series capacitors, C462 and C463, also form a signal dividing circuit. Output connector J455 is connected to this point and supplies a 20 kc signal for operation of the harmonic generator in the synthesizer circuit.

4-16. SYNTHESIZER.

(See figure 4-45.)

a. GENERAL.—The very high operating stability of the AN/WRR-2 can be attributed largely to the receiver's crystal-controlled, temperature-compensated master oscillator (par. 4-11). Frequency dividers, harmonic generators, and harmonic filters process the original locally generated signal to provide signals of frequencies related to submultiples of the master-oscillator frequency. These are picked off at stage outputs in the synthesizer section in the development of frequencies which:

(1) Contribute to the final IF conversion to 80 kc.

(2) Provide a fixed IF signal of 140 kc for use in continuous tuning.

(3) Furnish an 80 kc carrier signal to the LSB carrier amplifier (par. 4-10*d*).

(4) Trigger a blocking oscillator for the production of precise, 0.5 kc incremental pulses in conjunction with an interpolation oscillator of variable frequency in its 100 kc range.

As shown in the block diagram of figure 4-45, harmonic generator V801 in the synthesizer section receives from the frequency-divider section a 20 kc signal processed from the master-oscillator signal. Filter FL801 picks off the basic 20 kc signal, T802 the seventh harmonic (140 kc), and T803 the fourth harmonic (80 kc), and all three signals are passed on to associated circuits in the synthesizer and LSB detector-amplifier.

T803 applies its signal to a carrier amplifier stage in the LSB detector-amplifier. There the signal is amplified and directed to balanced-ring demodulators in the USB and LSB detector-amplifiers to serve as injected carriers for the demodulator circuits.

T802 supplies its 140 kc signal only when the receiver is set for continuous tuning by the CONT. position of TUNING switch S702.

FL801 passes the 20 kc signal through a pair of frequency-divider circuits (V802 and V803) with a 0.5 kc output. This signal excites pulse-shaping circuit V804 to trigger the next stage, blocking oscillator V805. This oscillator generates a harmonic spectrum in 0.5 kc incremental steps, making available output frequencies at least as high as the 820th harmonic.

To use this harmonic spectrum with the variable frequency output of interpolation oscillator V401 (see par. 4-14), a bandpass filter with a 100 kc bandwidth in the range of 720 kc to 820 kc (FL803, figure 4-48) is connected to the output of blocking oscillator V805.

When a particular harmonic of 0.5 kc in the abovementioned 100 kc range combines in mixer stage V806 with a properly related signal from the interpolation oscillator, a difference frequency of 140 kc is produced in the output of the mixer stage. This 140 kc signal is amplified in V807 and passed on to IF amplifier V508 in the injection IF section (figure 4-15). Mixing the 140 kc with a 220 kc signal generated in the injection IF results in an 80 kc IF (final conversion), output from the injection IF section.

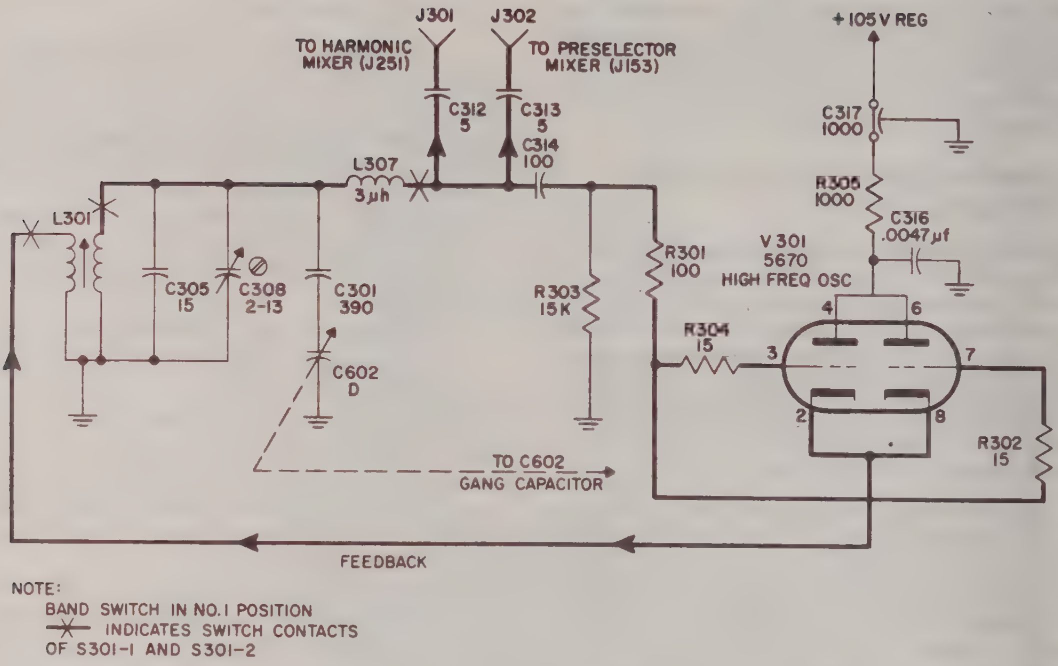

J301
J302
TO HARMONIC MIXER (J251)
TO PRESELECTOR MIXER (J153)
+105 V REG
C312 5
C313 5
C314 100
C317 1000
R305 1000
C316 .0047 µf
L307 3 µh
L301
C305 15
C308 2-13
C301 390
C602 D
R303 15K
R301 100
V301 5670 HIGH FREQ OSC
R304 15
R302 15
TO C602 GANG CAPACITOR
FEEDBACK
NOTE:
BAND SWITCH IN NO.1 POSITION
INDICATES SWITCH CONTACTS OF S301-1 AND S301-2

Figure 4-42. High-Frequency Oscillator, Simplified Schematic Diagram

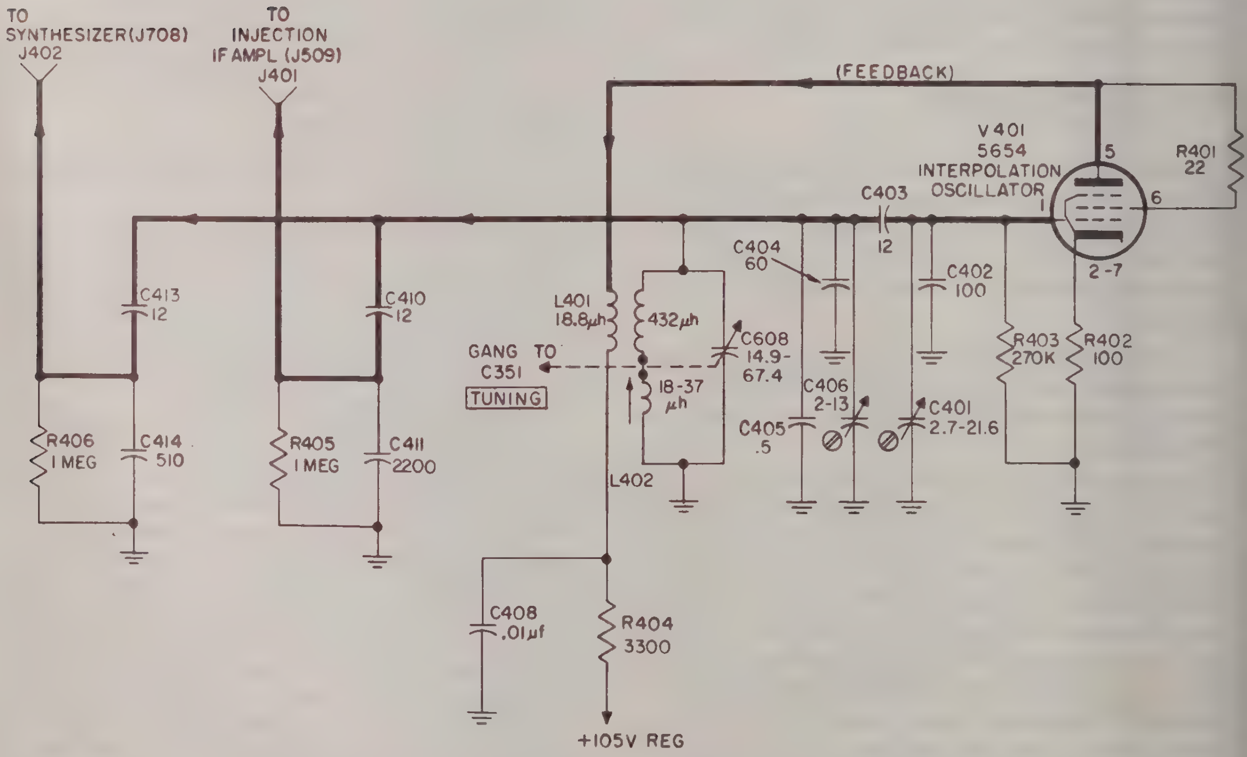

TO SYNTHESIZER (J708)
J402
TO INJECTION IF AMPL (J509)
J401
(FEEDBACK)
V401 5654 INTERPOLATION OSCILLATOR
R401 22
C403 12
C404 60
C402 100
C413 12
C410 12
L401 18.8µh
432µh
C608 14.9-67.4
GANG TO C351
TUNING
18-37 µh
C406 2-13
C401 2.7-21.6
C405 .5
R403 270K
R402 100
R406 1 MEG
C414 510
R405 1 MEG
C411 2200
L402
C408 .01µf
R404 3300
+105V REG

Figure 4-43. Interpolation Oscillator, Simplified Schematic Diagram

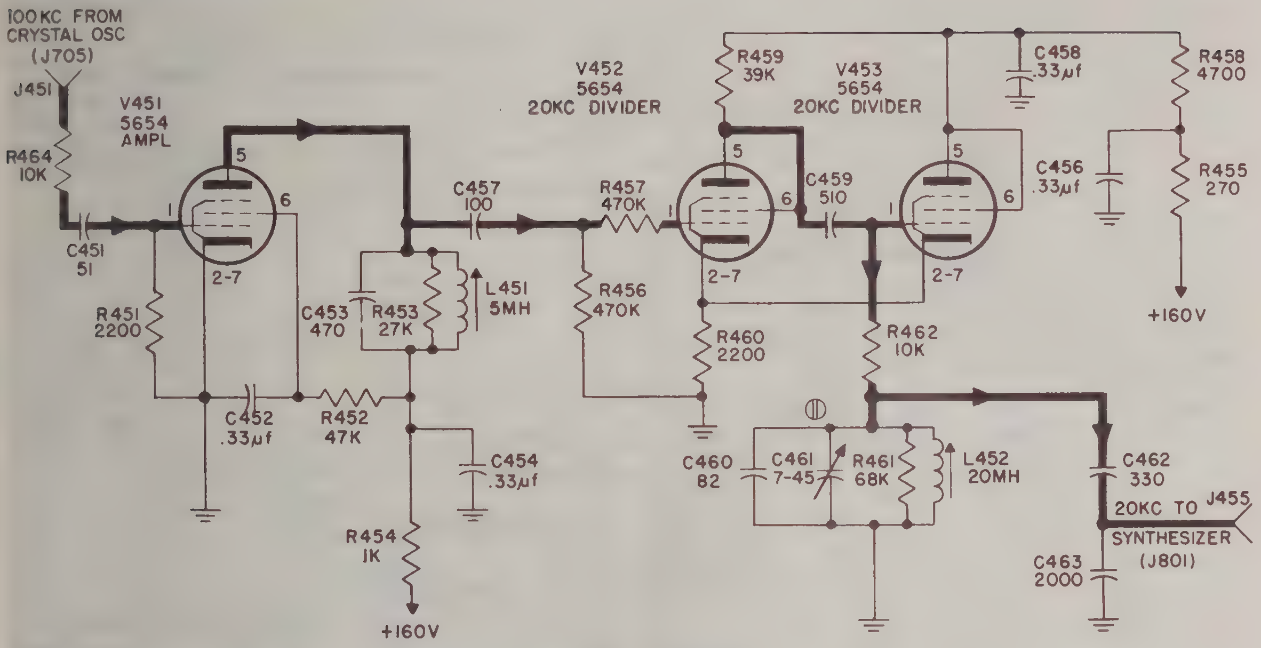

100KC FROM
CRYSTAL OSC
(J705)
J451
R464
10K
C451
51
V451
5654
AMPL
5
6
1
2-7
R451
2200
C452
.33μf
R452
47K
C453
470
R453
27K
L451
5MH
C454
.33μf
R454
1K
+160V
C457
100
V452
5654
20KC DIVIDER
R457
470K
R456
470K
R459
39K
R460
2200
V453
5654
20KC DIVIDER
C459
510
R462
10K
C460
82
C461
7-45
R461
68K
L452
20MH
C458
.33μf
R458
4700
C456
.33μf
R455
270
+160V
C462
330
20KC TO
SYNTHESIZER
(J801)
J455
C463
2000

Figure 4-44. Frequency Divider, Simplified Schematic Diagram

b. HARMONIC GENERATOR V801.—Figure 4-46 is a schematic diagram of harmonic generator V801, the function of which is described in subparagraph *a.* V801 gets its 20 kc signal from the frequency dividers by way of connector J801 and capacitor C801.

c. DIVIDERS V802 and V803. *(See figure 4-47.)*—Frequency dividers V802 and V803 are locked oscillators which divide the 20 kc signal from the harmonic generator and filter FL801 by four (V802) and then by ten (V803) to 0.5 kc, which is applied to pulse shaper V804 for use as an accurately controlled trigger signal.

d. PULSE SHAPER V804, BLOCKING OSCILLATOR V805. *(See figure 4-48.)*—Triggered by pulse shaper V804, blocking oscillator V805 produces sharp pulses, ranging in 0.5 kc steps from a fundamental 0.5 kc to beyond its 820th harmonic. A portion (720 kc to 820 kc) of this spectrum provides harmonics to be mixed in the injection IF amplifier with signals from variable-output interpolation oscillator V401 to produce a difference frequency of 140 kc for use in the development of the final receiver IF of 80 kc.

The pulse shaper is a dual triode. The control grid

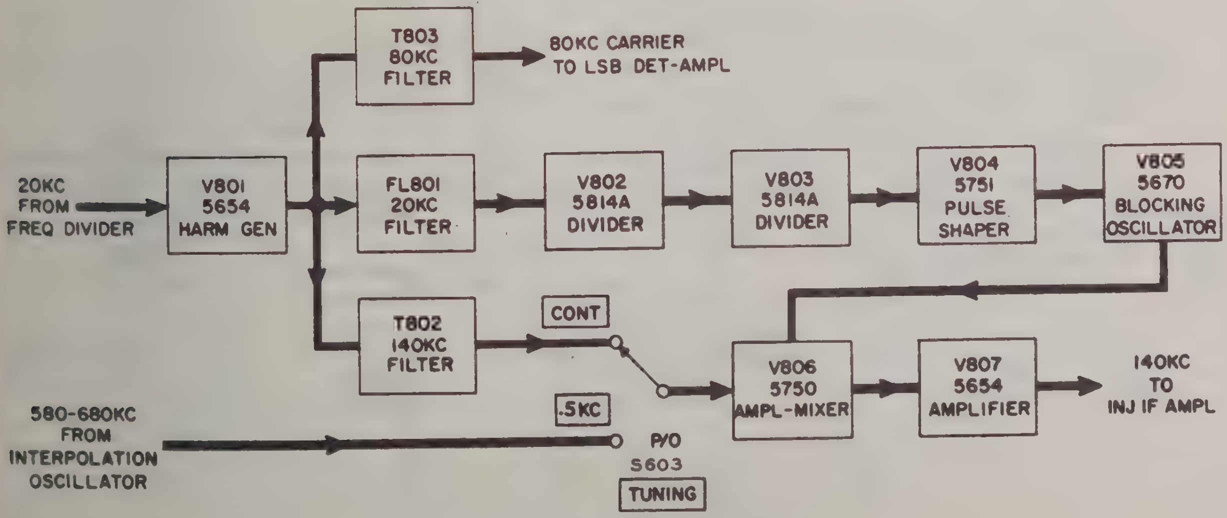

T803
80KC
FILTER
80KC CARRIER
TO LSB DET-AMPL
20KC
FROM
FREQ DIVIDER
V801
5654
HARM GEN
FL801
20KC
FILTER
V802
5814A
DIVIDER
V803
5814A
DIVIDER
V804
5751
PULSE
SHAPER
V805
5670
BLOCKING
OSCILLATOR
T802
140KC
FILTER
CONT
.5KC
V806
5750
AMPL-MIXER
V807
5654
AMPLIFIER
140KC
TO
INJ IF AMPL
580-680KC
FROM
INTERPOLATION
OSCILLATOR
P/O
S603
TUNING

Figure 4-45. Synthesizer, Block Diagram

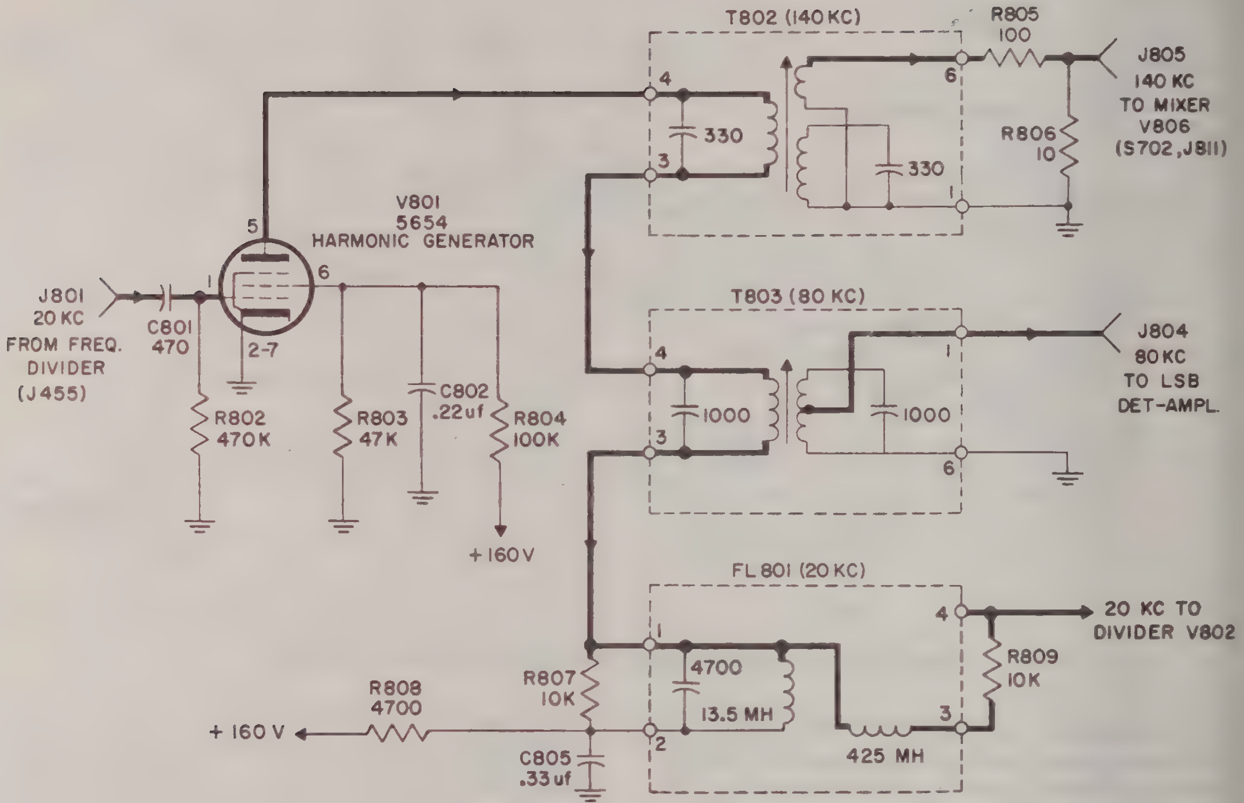

T802 (140 KC)
R805
100
J805
140 KC
TO MIXER
V806
(S702, J811)
R806
10
330
330
4
3
6
1
V801
5654
HARMONIC GENERATOR
5
6
1
2-7
J801
20 KC
FROM FREQ.
DIVIDER
(J455)
C801
470
R802
470K
R803
47K
C802
.22uf
R804
100K
+160V
T803 (80 KC)
J804
80 KC
TO LSB
DET-AMPL.
1000
1000
FL801 (20 KC)
20 KC TO
DIVIDER V802
R809
10K
R807
10K
4700
13.5 MH
425 MH
R808
4700
+ 160 V
C805
.33 uf

Figure 4-46. Harmonic Generator V801, Simplified Schematic Diagram

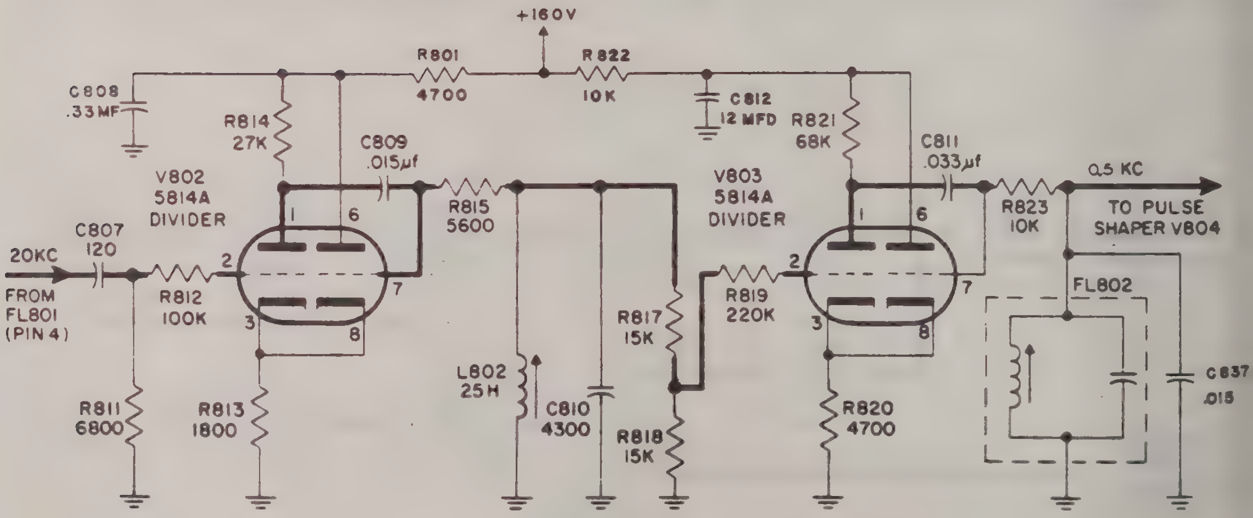

+160V
R801
4700
R822
10K
C808
.33 MF
C812
12 MFD
R814
27K
R821
68K
C809
.015µf
C811
.033µf
0.5 KC
TO PULSE
SHAPER V804
V802
5814A
DIVIDER
V803
5814A
DIVIDER
R815
5600
R823
10K
C807
120
20KC
FROM
FL801
(PIN 4)
R812
100K
R817
15K
R819
220K
FL802
R811
6800
R813
1800
L802
25H
C810
4300
R818
15K
R820
4700
C837
.015

Figure 4-47. Dividers V802 and V803, Simplified Schematic Diagram

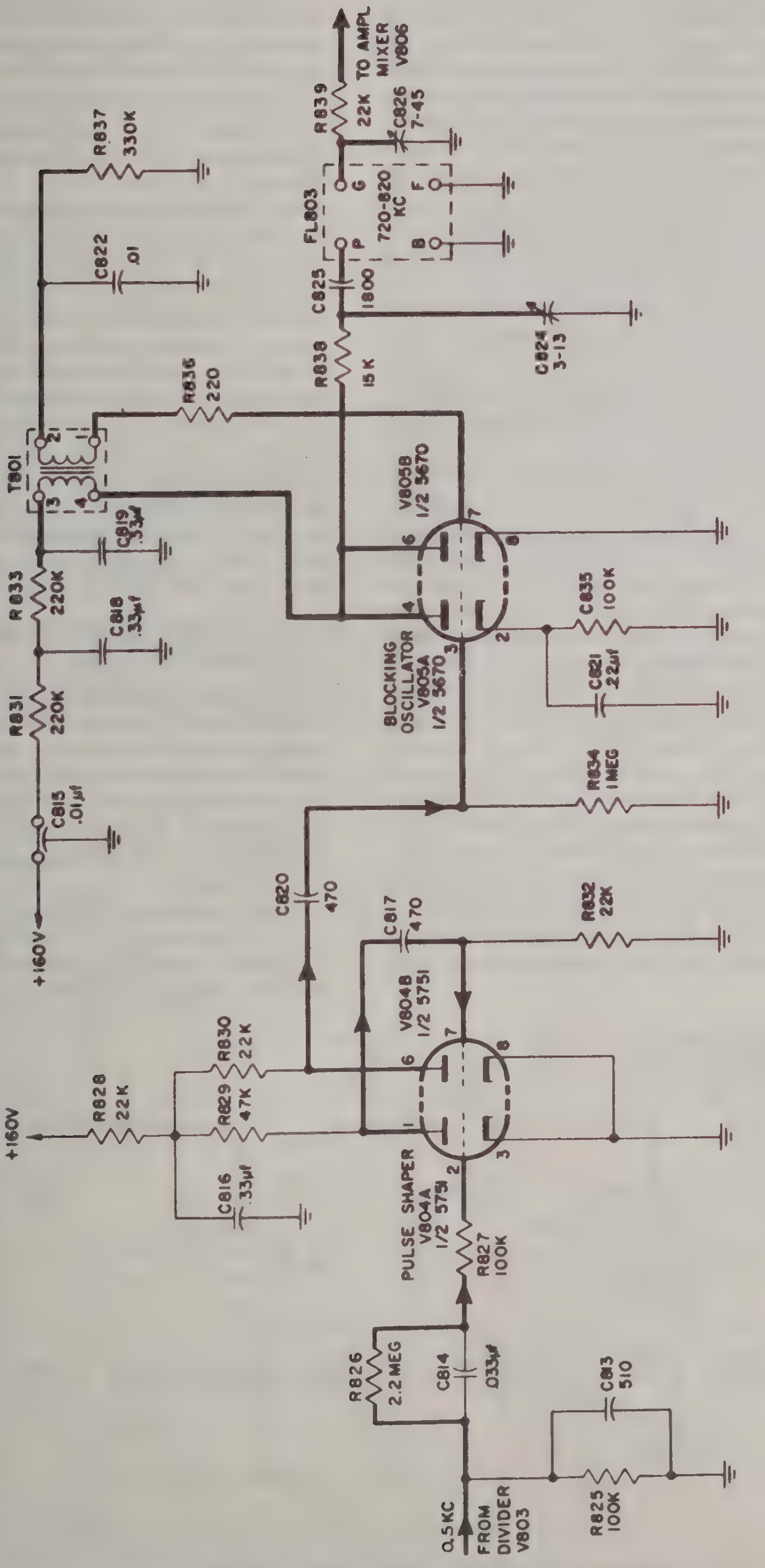

TO AMPL MIXER V806
R839 22K
C826 7-45
R837 330K
FL803
720-820 KC
P
G
B
F
C822 .01
C825 1800
C824 3-13
R838 15 K
R836 220
T801
13
21
4
1
C819 .33µf
V805B 1/2 5670
R833 220K
C818 .33µf
6
7
8
4
3
2
BLOCKING OSCILLATOR V805A 1/2 5670
C835 100K
C821 .22µf
R831 220K
R834 1MEG
C815 .01µf
+160V
C820 470
C817 470
R832 22K
V804B 1/2 5751
R830 22K
R829 47K
R828 22K
+160V
C816 .33µf
PULSE SHAPER V804A 1/2 5751
R827 100K
R826 2.2 MEG
C814 .033µf
C813 510
0.5KC FROM DIVIDER V803
R825 100K

Figure 4-48. Pulse Shaper V804 and Blocking Oscillator V805, Simplified Schematic Diagram

(pin 2) of V804A receives from the frequency divider a 0.5 kc signal, the positive half-cycle of which is clipped by grid limiting, the negative half-cycle by the tube being driven into cutoff. The 0.5 kc output of V804A is a square wave developed across plate load resistor R829 and coupled to the control grid of V804B through differentiating network C817 and R832. This changes the square wave to narrow positive- and negative-going spikes which correspond to the leading and trailing edges of the square wave. These spikes are amplified and inverted by V804B. The positive spikes developed across resistor R830 and coupled to blocking oscillator V805 provide a 0.5 kc sync pulse, which locks V805 in by occurring at a time slightly earlier than the free-running frequency of V805.

V805 is a dual-triode tube one half of which (V805A) acts as a triggering tube for blocking oscillator V805B, which operates as follows:

If capacitor C822 is charged negatively and V805B cut off, the former will discharge through resistor R837, reducing the bias on V805B until it begins to conduct. The decrease in plate voltage is reflected into the grid circuit through T801 as an increase in positive voltage at the grid. With the grid more positive, plate current again increases, and the cycle of decrease in plate voltage continues until tube saturation is reached. With no further increase in the field of plate winding T801 and no transfer of positive voltage to the grid, capacitor C822 again discharges through R837, but only from its positively polarized state, causing the grid to become less positive. Plate current decreases and plate voltage increases, causing a negative voltage to be induced in the grid winding and on the tube's grid. This causes further change in the same direction until V805B is cut off again and the cycle is complete. The pulse width is determined by time constant C822-R-837, and the rise and decay of the output is determined by the characteristics of pulse transformer T801.

The output of V805B is applied through bandpass filter FL803 to amplifier-mixer V806 to combine with another input signal from the interpolation oscillator or from T802 (see figure 4-45).

e. AMPLIFIER-MIXER V806, AMPLIFIER V807. *(See figure 4-49.)*—Amplifier-mixer V806 produces a 140 kc signal for later use in establishing the final conversion signal of 80 kc.

One of the inputs (grid 3, pin 7) to V806 is the 0.5 kc harmonic in the range of 720 kc to 820 kc from blocking oscillator V805. During incremental tuning, the other input (grid 1, pin 1) is a signal in the range of 580 kc to 680 kc from interpolation oscillator V401. The difference frequency is 140 kc, applied to bandpass filter FL804. During continuous tuning, the 140 kc is picked off directly from filter T802 and passed to FL804. At the same CONT. setting of TUNING switch S603, plate voltage is removed from blocking oscillator V805B, so that the only signal now applied to V806 is the 140 kc signal from T802. The 140 kc signal is fed to IF amplifier stage V807, the output of which connects through jack J815 to the injection IF amplifier section (figure 4-15), the input jack of which is J511.

4-17. CONVERTER POWER SUPPLY.
(See figure 4-50.)

The receiver has two power supplies, converter and demodulator. The converter power supply serves all circuits except those of the three detector-amplifiers, upper- and lower-sideband and AM. Voltage- and current-stabilizing circuits are incorporated in the converter power supply to ensure steady inputs for voltage-sensitive components, in accordance with stability requirements.

Input transformer T901 has a primary tapped for use with ac inputs of 105, 115, and 125 volts. The secondary windings provide high voltages for rectifier operation and low voltages for filaments. Terminals 5 and 6 are

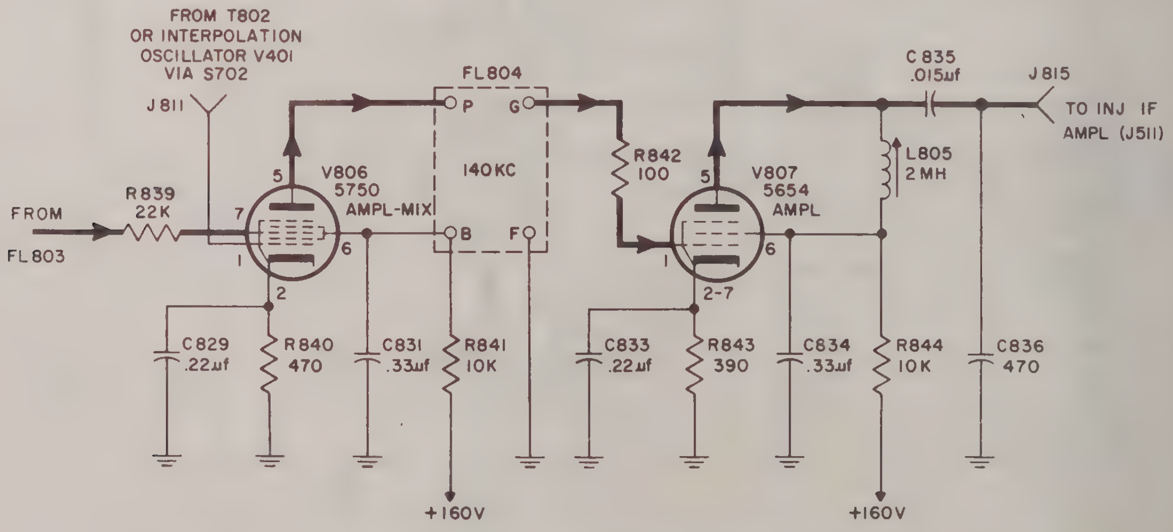


Figure 4-49. Amplifier-Mixer V806 and Amplifier V807, Simplified Schematic Diagram

the high-voltage secondary connections for full-wave bridge rectifier CR901-CR902-CR903-CR904. The output of the rectifier goes to a filter consisting of choke L901 and dual capacitor C901. This filter is supplemented by a resistor-capacitor section consisting of resistor R904 and dual capacitor C902. Besides providing added filtering, the supplementary section makes available pick-off points for output voltages of various magnitudes and degrees of filtering. Voltage stabilization is provided by regulator tubes V902 and V903 and limiting resistors R902 and R903. These voltages are available at terminals 6 and 4 of TB605.

Filament voltage for HF oscillator V301 is supplied by an individual secondary winding, terminals 14 and 15, and stabilized by CR905 and CR906. CR905 and CR906 along with R901 and R905 form a voltage regulator to provide a constant 6.8 volts to the filament of V301.

Two other low-voltage windings are conventional, supplying 6.15 volts and 6.3 volts at secondary terminals 7 to 10 and 11 to 13 as shown in figure 4-50.

4-18. DEMODULATOR POWER SUPPLY.

(See figure 4-51.)

Operation of the demodulator power supply is similar to that of the unregulated portion of the converter power supply (par. 4-17). The demodulator power supply uses a conventional bridge-type rectifier (CR1201, CR1202, CR1203, and CR1204) connected to a choke input filter (L1201). Additional resistor-capacitor filter sections are provided for the various B+ output lines. Functional sections of the demodulator get their filament voltage from a 6.3 vac winding (pins 7 and 9) of power transformer T1201.

4-19. BLISTERS.

(See figure 4-52.)

Connectors for external cabling and interdrawer lines between the demodulator and converter are mounted on two nonconducting strips, called blisters, one each on the converter and demodulator. Figure 4-53 shows all input lines which pass through the blisters. The demodulator blister contains also filters FL1801 through FL1803. The first two are low-pass filters used in the output lines of the detector-amplifier sections; FL1803 is a radio-frequency filter used in the primary ac power line.

4-20. DRIFT-CANCELLING LOOPS.

(See figure 4-53.)

a. GENERAL.—Circuit loops ensure the operating stability of the receiver by nullifying the effects of drift in the high-frequency oscillator (V301) and the interpolation oscillator (V401). Figure 4-53 is a block diagram showing the relationship of the two loops.

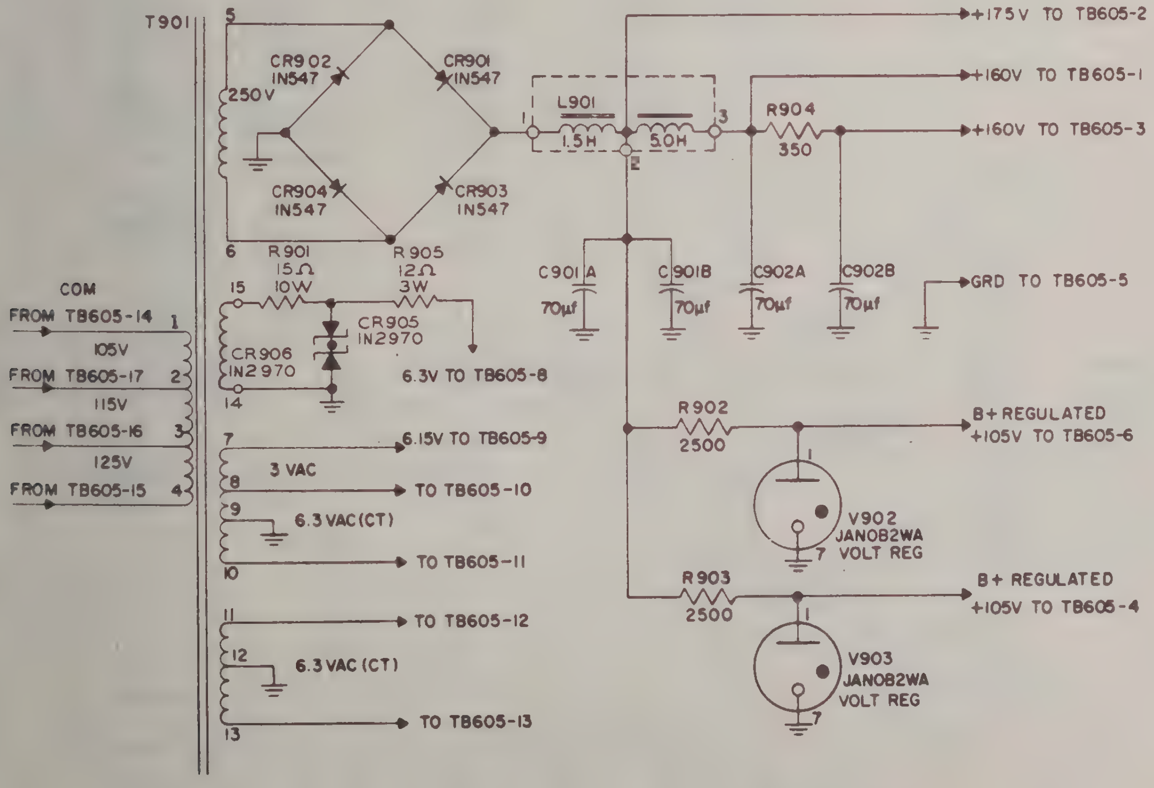

T901
5
CR902
IN547
CR901
IN547
250V
L901
1.5H
5.0H
1
2
3
R904
350
+175V TO TB605-2
+160V TO TB605-1
+160V TO TB605-3
CR904
IN547
CR903
IN547
6
R901
15Ω
10W
R905
12Ω
3W
15
CR905
IN2970
CR906
IN2970
14
6.3V TO TB605-8
C901A
70μf
C901B
70μf
C902A
70μf
C902B
70μf
GRD TO TB605-5
COM
FROM TB605-14
1
105V
FROM TB605-17
2
115V
FROM TB605-16
3
125V
FROM TB605-15
4
7
6.15V TO TB605-9
3 VAC
8
TO TB605-10
9
6.3 VAC (CT)
10
TO TB605-11
11
TO TB605-12
12
6.3 VAC (CT)
13
TO TB605-13
R902
2500
B+ REGULATED
+105V TO TB605-6
V902
JANOB2WA
VOLT REG
R903
2500
B+ REGULATED
+105V TO TB605-4
V903
JANOB2WA
VOLT REG
1
7

Figure 4-50. Converter Power Supply, Simplified Schematic Diagram

b. HIGH-FREQUENCY OSCILLATOR. *(See figure 4-54.)*—Initial frequency conversion takes place in mixer stage V151 by the combining of signals from the preselector (F1) and HF oscillator V301 (F3) to produce a difference frequency of F3 minus F1. This signal is passed through the tunable IF section and IF amplifier stage V501 to mixer stage V502 for a second conversion. Without drift compensation, the latter mixer stage would ordinarily receive another signal from a second local oscillator to establish the desired second conversion frequency. This procedure, while effecting the desired conversion, in no way compensates for variations in the frequencies of the local oscillators involved, the result being corresponding variations in the difference frequency of the converted signals. To counteract this effect, the output of HF oscillator V301 (F3), besides combining with the incoming signal (F1) in mixer stage V151, mixes with a second signal originating in a crystal-controlled oscillator. This second signal is modified by frequency dividers, harmonic generator, and harmonic amplifiers to bring it to the proper frequency (F2) to mix with the HF oscillator signal and produce a difference frequency F3-F2, which, in turn, is fed through injection amplifiers V504 and V505 to mixer stage V506, where it combines with a signal from low-frequency interpolation oscillator V401 (F4). Mixing in this stage provides an output signal through injection frequency amplifier V507 which, when combined in V502 with the output from V501, results in the second frequency conversion.

Figure 4-54 indicates symbolically the frequency differences relative to signal inputs to the various mixer stages. By means of the loop arrangement, of which the HF oscillator (V301) is a part, any variation in its frequency output is transmitted equally and in the same sense to the two legs of the loop. Therefore, the difference frequency produced in common mixer stage V502 (by mixing of the signals from the legs of the loop) does not contain HF oscillator component F3. Elimination of F3 from the output of V502 is equivalent to nullification of the effect of drift that could be caused by the presence of this signal.

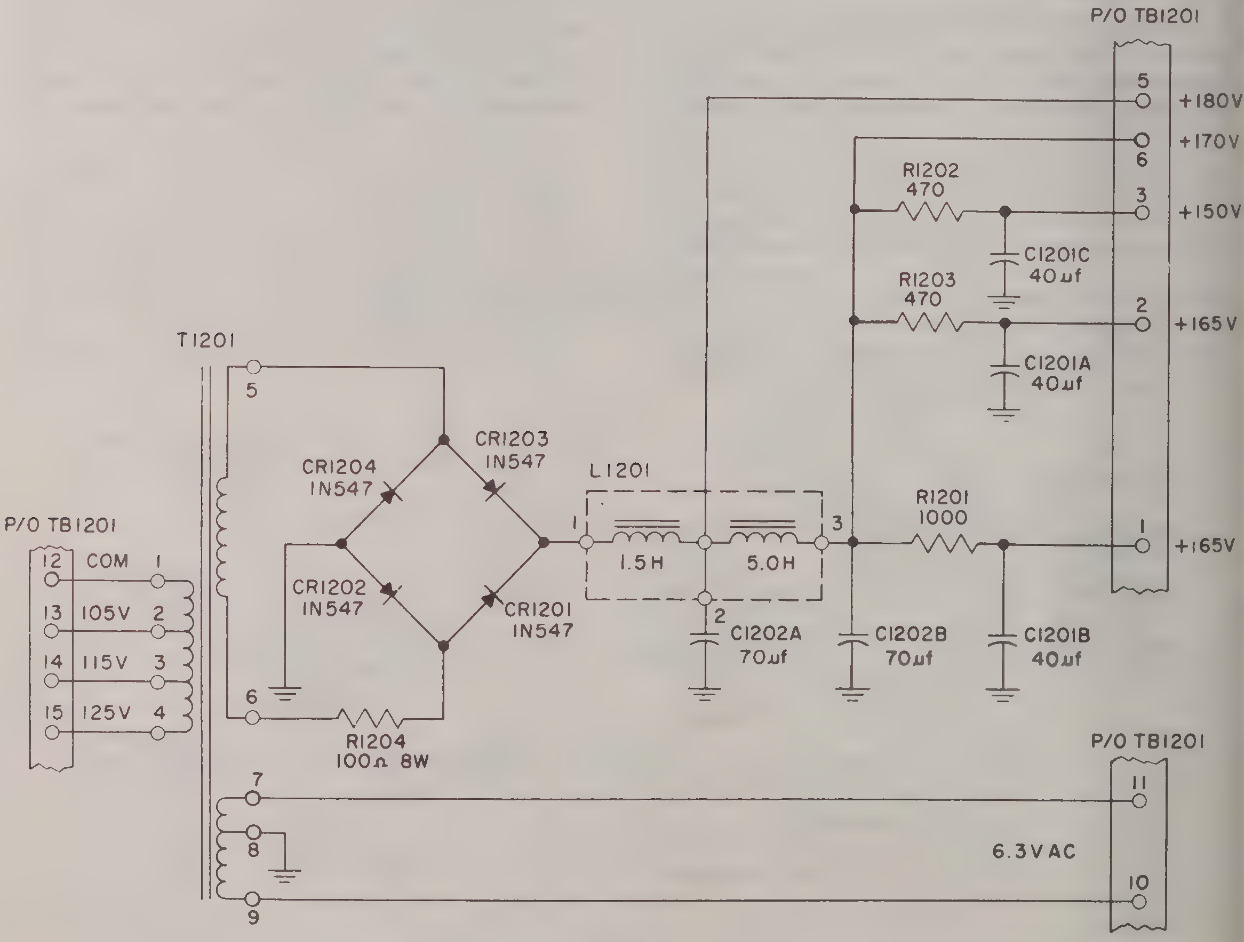

P/O TB1201
5
+180V
+170V
6
3
+150V
R1202
470
C1201C
40µf
R1203
470
2
+165V
C1201A
40µf
T1201
5
CR1203
1N547
CR1204
1N547
L1201
1
3
R1201
1000
1
+165V
1.5H
5.0H
P/O TB1201
12
COM
1
13
105V
2
14
115V
3
15
125V
4
CR1202
1N547
CR1201
1N547
2
C1202A
70µf
C1202B
70µf
C1201B
40µf
6
R1204
100Ω 8W
P/O TB1201
7
11
8
6.3VAC
9
10

Figure 4-51. Demodulator Power Supply, Simplified Schematic Diagram

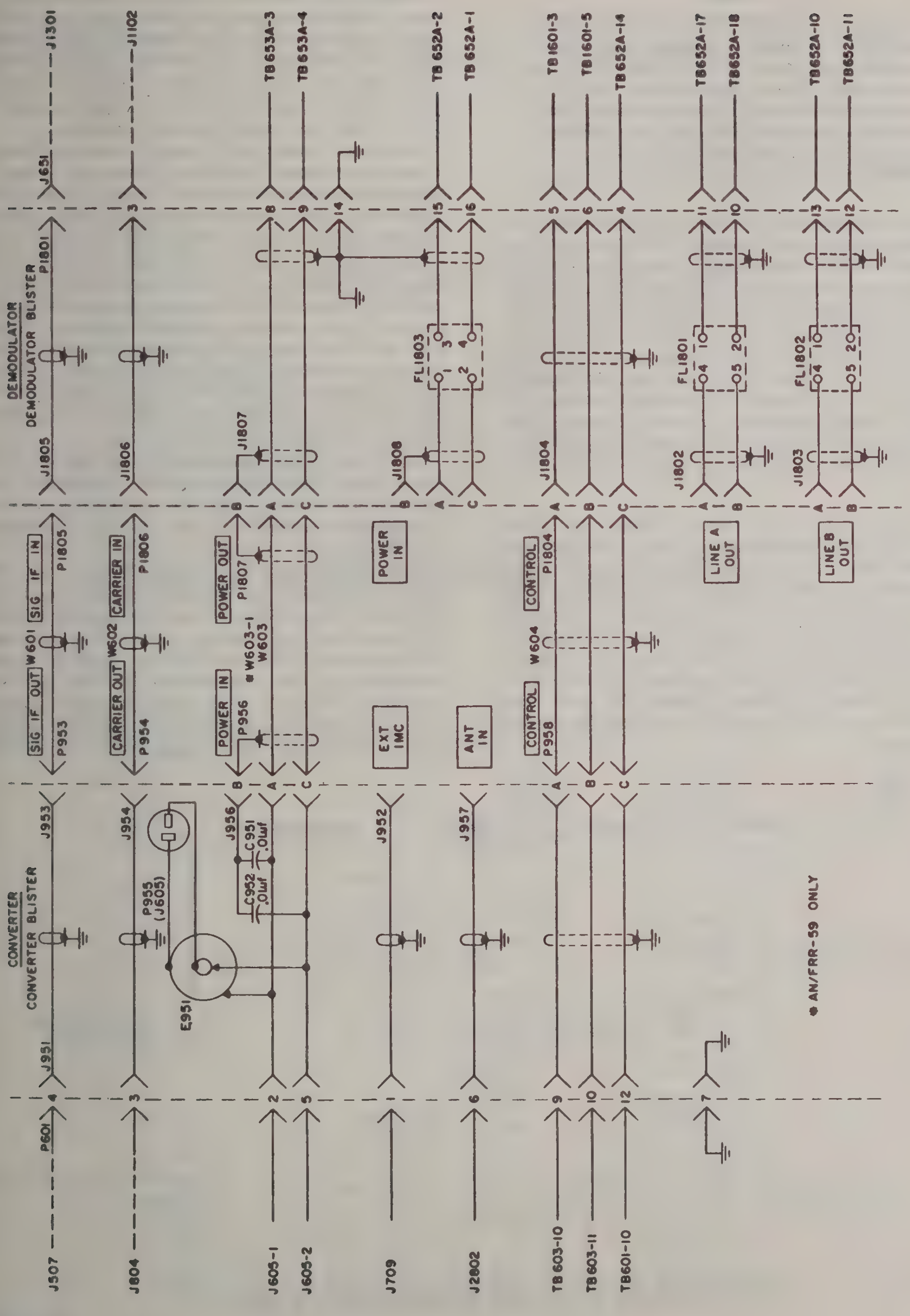

DEMODULATOR
DEMODULATOR BLISTER
CONVERTER
CONVERTER BLISTER
J1301
J1102
TB653A-3
TB653A-4
TB652A-2
TB652A-1
TB1601-3
TB1601-5
TB652A-14
TB652A-17
TB652A-18
TB652A-10
TB652A-11
J651
P1801
J1805
J1806
J1807
J1808
J1804
J1802
J1803
FL1803
FL1801
FL1802
SIG IF IN
P1805
CARRIER IN
P1806
POWER OUT
P1807
POWER IN
CONTROL
P1804
LINE A OUT
LINE B OUT
W601
W602
W603-1
W603
W604
SIG IF OUT
P953
CARRIER OUT
P954
POWER IN
P956
EXT IMC
ANT IN
CONTROL
P958
J953
J954
J956
C951 .01uf
C952 .01uf
J952
J957
P955 (J605)
E951
J951
P601
J507
J804
J605-1
J605-2
J709
J2802
TB603-10
TB603-11
TB601-10
* AN/FRR-59 ONLY

Figure 4-52. Converter-Demodulator Interconnections

Note

> So far as drift-cancellation is concerned, mixer stage V251, if made to operate at an output frequency consistent with the requirement of mixer stage V502 to produce the second frequency conversion, would have sufficed to close the drift-cancellation loop. The increased complexity of the actual loop circuit is based on another requirement related to variable tuning.

Interpolation oscillator V401 provides variable frequency signal injection for mixer V506. This allows the frequency of the V506 output signal to be varied in accordance with variations in IF stage V501, so that the difference between them always equals the constant second frequency conversion (220 kc). Any frequency drift in this oscillator is a detriment to receiver stability. To neutralize the effect of drift, a second loop, of which V401 is a part, is established to eliminate interpolation oscillator output frequency F4 from the output of the third frequency conversion stage. Since component F4 is not in the succeeding stages, the drift effect has been voided.

c. INTERPOLATION OSCILLATOR. *(See figure 4-55.)*—The drift-canceling loop for the interpolation oscillator parallels that of the HF oscillator except that interpolation oscillator signal F4 is mixed with an incoming signal, F3 minus F2. The incoming and oscillator signals add in mixer stage V506. The sum frequency signal goes to mixer stage V502 via injection amplifier V507 and mixes with incoming signal F3 minus F1 to produce the second conversion signal. The latter is fed to mixer stage V503 via IF filter FL502 for a third conversion.

Interpolation oscillator signal F4 also combines in mixer V806 with signal F5, which originates in the crystal oscillator and becomes modified in the frequency divider and synthesizer sections. The output of mixer stage V806 goes to mixer V503 via injection amplifier V508, where it serves as the other signal needed by V503 to make the third frequency conversion.

Figure 4-55 shows the frequency transfers involved in the various stages of the loop. Because of the loop, of which the interpolation oscillator is a part, any variation in oscillator output frequency from any cause is relayed to both legs of the loop. Since each leg receives the same frequency variation, the result of mixing the signals of each leg in the same mixer stage (V503) is an output signal free of frequency component F4. For example, if the incoming signal frequency to mixer V506 is 825 kc and the interpolation oscillator signal frequency is 630 kc, the two signals total 1455 kc. This signal combines with the 1675 kc signal from V501 to provide a 220 kc signal at the output of mixer V502, then to be applied to mixer V503.

On the other leg of the loop, the interpolation oscillator output of 630 kc mixes with the 770 kc signal from the synthesizer section. The difference frequency of 140 kc is applied to mixer V503, and this stage presents an 80 kc IF signal in its output.

If the interpolation oscillator has no drift, the final output from mixer stage V503 is just as described above. If, however, the oscillator output increases by 100 cps, the frequencies available for mixing at mixer stage V503 are now 219.9 kc and 139.9 kc. Since the change in frequency at the interpolation oscillator has been transferred to both legs of the loop by the same amount (100 cps) and in the same sense at the inputs of V503, the output of mixer V503 remains 80 kc.

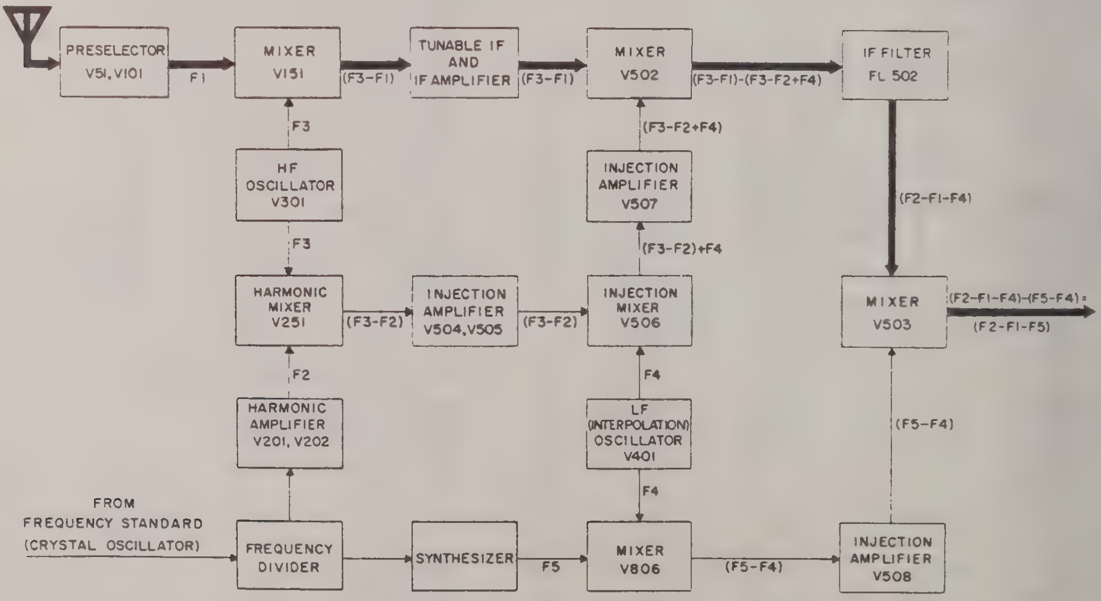

PRESELECTOR
V51, V101
F1
MIXER
V151
(F3−F1)
TUNABLE IF AND IF AMPLIFIER
(F3−F1)
MIXER
V502
(F3−F1)−(F3−F2+F4)
IF FILTER
FL 502
F3
HF OSCILLATOR
V301
(F3−F2+F4)
INJECTION AMPLIFIER
V507
(F2−F1−F4)
F3
(F3−F2)+F4
HARMONIC MIXER
V251
(F3−F2)
INJECTION AMPLIFIER
V504, V505
(F3−F2)
INJECTION MIXER
V506
MIXER
V503
(F2−F1−F4)−(F5−F4) =
(F2−F1−F5)
F2
F4
HARMONIC AMPLIFIER
V201, V202
LF (INTERPOLATION) OSCILLATOR
V401
(F5−F4)
F4
FROM FREQUENCY STANDARD (CRYSTAL OSCILLATOR)
FREQUENCY DIVIDER
SYNTHESIZER
F5
MIXER
V806
(F5−F4)
INJECTION AMPLIFIER
V508

Figure 4-53. Receiver Drift Cancellation, Block Diagram

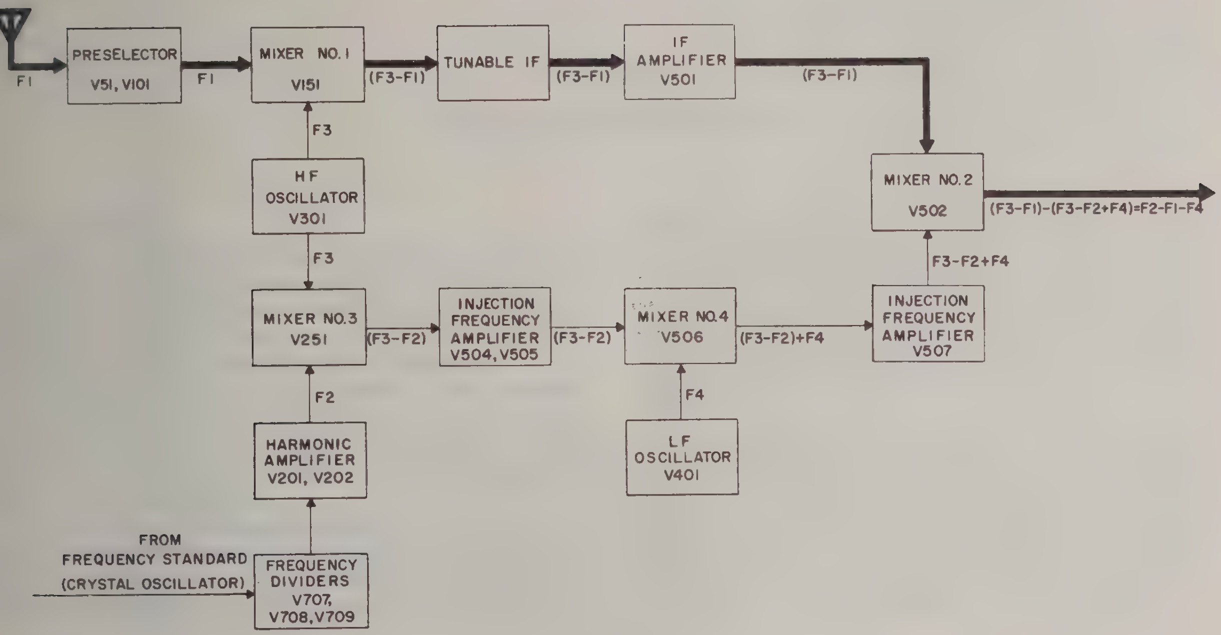

F1
PRESELECTOR
V51, V101
F1
MIXER NO. 1
V151
(F3-F1)
TUNABLE IF
(F3-F1)
IF AMPLIFIER
V501
(F3-F1)
F3
HF OSCILLATOR
V301
F3
MIXER NO. 2
V502
(F3-F1)-(F3-F2+F4)=F2-F1-F4
F3-F2+F4
MIXER NO.3
V251
(F3-F2)
INJECTION FREQUENCY AMPLIFIER
V504, V505
(F3-F2)
MIXER NO.4
V506
(F3-F2)+F4
INJECTION FREQUENCY AMPLIFIER
V507
F2
F4
HARMONIC AMPLIFIER
V201, V202
LF OSCILLATOR
V401
FROM FREQUENCY STANDARD (CRYSTAL OSCILLATOR)
FREQUENCY DIVIDERS
V707, V708, V709

Figure 4-54. High Frequency Oscillator Drift Cancellation, Block Diagram

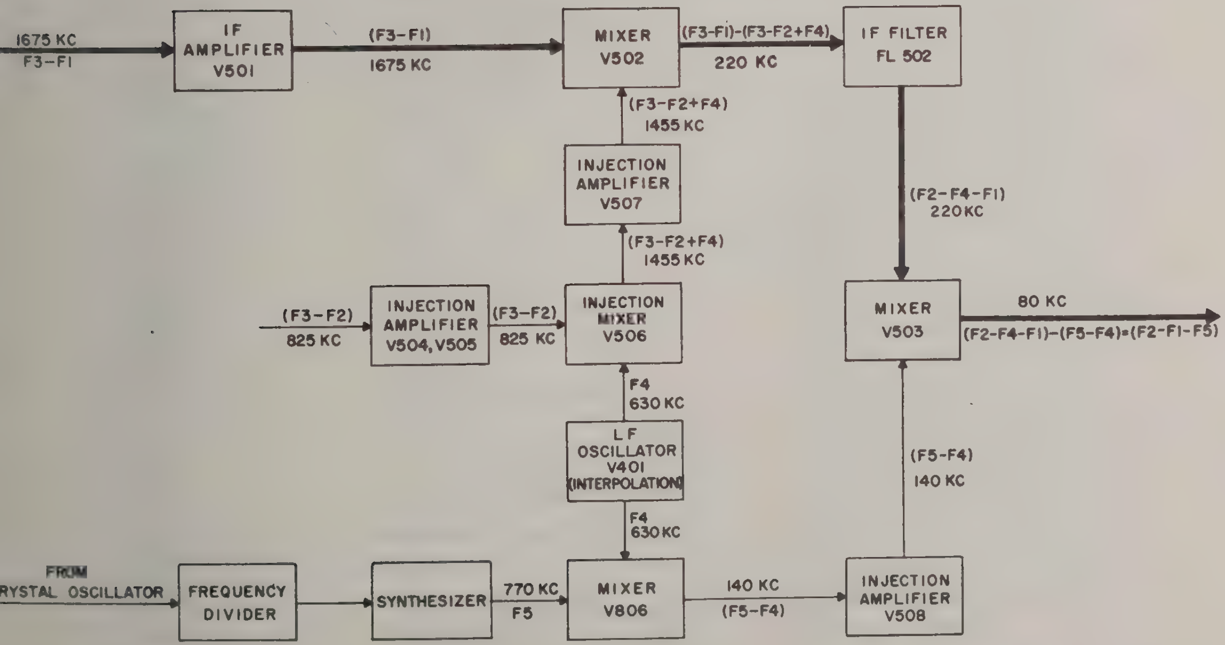

1675 KC
F3-F1
IF AMPLIFIER
V501
(F3-F1)
1675 KC
MIXER
V502
(F3-F1)-(F3-F2+F4)
220 KC
IF FILTER
FL 502
(F3-F2+F4)
1455 KC
INJECTION AMPLIFIER
V507
(F2-F4-F1)
220KC
(F3-F2+F4)
1455 KC
(F3-F2)
825 KC
INJECTION AMPLIFIER
V504, V505
(F3-F2)
825 KC
INJECTION MIXER
V506
MIXER
V503
80 KC
(F2-F4-F1)-(F5-F4)=(F2-F1-F5)
F4
630 KC
LF OSCILLATOR
V401
(INTERPOLATION)
(F5-F4)
140 KC
F4
630 KC
FROM
CRYSTAL OSCILLATOR
FREQUENCY DIVIDER
SYNTHESIZER
770 KC
F5
MIXER
V806
140 KC
(F5-F4)
INJECTION AMPLIFIER
V508

Figure 4-55. Interpolation Oscillator Drift Cancellation, Block Diagram

SECTION 5

TROUBLE-SHOOTING

5-1. GENERAL.

Effective trouble-shooting of electronic equipment consists of locating the circuit at fault and identifying the defective component, followed by repair and adjustments to return the equipment to normal operating condition. A systematic procedure is required.

The first step is a visual inspection of the complete equipment, with special attention given to easily overlooked troubles, such as incorrectly positioned controls, blown fuses, or bad connections. A logical method of trouble-shooting follows.

Signal tracing is especially effective in trouble-shooting. With this method, the absence or abnormality of the received signal at a particular point or circuit section indicates the circuit at fault and eliminates properly operating circuits as the source of trouble. In general, for radio receiving equipment that is operable but deficient in some respect, signal tracing begins at the antenna input circuit and is carried through the various stages toward the output circuits. When the equipment is not operable, the tracing direction is reversed, from the output of the receiver back toward the antenna input circuit.

If a preliminary inspection of the receiver does not reveal the trouble, it may be possible to relate the fault to one of the two drawers by noting abnormal panel meter indications or changes in control adjustments. Eliminating one drawer as a source of trouble permits concentration on the other. Trouble-shooting the overall equipment will include the following steps:

TABLE 5-1. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, REFERENCE NUMBERS AND SUBASSEMBLY LOCATIONS

REFERENCE NUMBERS	SUBASSEMBLY	SUBASSEMBLY LOCATION
51— 99	Preselector, first RF	Converter drawer, lower deck
101— 149	Preselector, second RF	Converter drawer, lower deck
151— 199	Preselector mixer	Converter drawer, lower deck
201— 249	Harmonic amplifier	Converter drawer, lower deck
251— 299	Harmonic mixer	Converter drawer, lower deck
301— 349	HF oscillator	Converter drawer, lower deck
401— 449	Tunable IF filter	Converter drawer, lower deck
501— 599	Injection IF amplifier	Converter drawer, lower deck
601— 649	Converter panel	Converter drawer, control panel
651— 699	Demodulator panel	Demodulator drawer, control panel
701— 799	Crystal oscillator	Converter drawer, upper deck
801— 899	Synthesizer	Converter drawer, upper deck
901— 949	Converter power supply	Converter drawer, upper deck
951— 999	Converter blister	Bottom of enclosure at rear
1001—1099	USB detector-amplifier	Demodulator drawer, lower deck
1101—1199	LSB detector-amplifier	Demodulator drawer, lower deck
1201—1299	Demodulator power supply	Demodulator drawer, lower deck
1301—1399	80 kc filter unit	Demodulator drawer, lower deck
1601—1799	AM detector-amplifier	Demodulator drawer, upper deck
1801—1899	Demodulator blister	Top of enclosure at rear
2801—2849	Antenna coupler	Converter drawer, lower deck

NOTE: The abbreviations USB, LSB, and AM refer to the upper, lower, and double sideband detector-amplifiers, respectively.

a. Determining the major unit at fault

b. Localizing the trouble to a subassembly (functional section) of the major unit

c. Trouble-shooting the subassembly to determine the defective circuit

d. Removing the subassembly for repairs

e. Replacing the subassembly

f. Checking the equipment to verify that the fault has been corrected.

5-2. TEST EQUIPMENT AND SPECIAL TOOLS.

a. TEST EQUIPMENT.—No special tools are required for trouble-shooting the receiver. A list of the required test equipment is given below. Equivalent test equipment may be substituted.

(1) Converter Patch Cable W624 (supplied with equipment)

(2) Multimeter AN/PSM-4C

(3) Signal Generator AN/URM-25D (2 required)

(4) Vacuum Tube Voltmeter AN/USM-143

(5) Vacuum Tube Voltmeter ME-6E/U

(6) Audio Oscillator AN/URM-127

(7) Oscilloscope OS-8E/U

(8) Vacuum Tube Voltmeter AN/USM-116.

b. TEST CABLES.— A patch cable (W624) is provided for operating the converter drawer when it is extended. The demodulator drawer will operate extended without extra cabling. When the patch cable is used, the receiver will operate with both drawers extended,

TABLE 5-2. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, PRELIMINARY CONTROL SETTINGS

CONTROL	LOCATION	SETTING
POWER ON/OFF	Lower demodulator panel	OFF
RECEPTION A.M./S.S.B.	Lower demodulator panel	A.M.
O.L. THRES.	Upper demodulator panel	OFF
A.M.-A.G.C. TIME CONST.	Upper demodulator panel	OFF
A.M. A.F. LEVEL	Upper demodulator panel	0
R.F. SELECTIVITY B.W.-KCS.	Upper demodulator panel	12.0
B.F.O.	Upper demodulator panel	OFF
VAR. B.F.O.	Upper demodulator panel	0
SILENCER	Upper demodulator panel	OFF
PHONE LEVEL	Lower demodulator panel	0
A.F. LEVEL LINE A	Lower demodulator panel	0
A.G.C. UPPER ON/OFF/S.S.B.	Lower demodulator panel	OFF
A.G.C. UPPER SLOW/FAST	Lower demodulator panel	FAST
A.F. LEVEL LINE B	Lower demodulator panel	0
A.G.C. LOWER ON/OFF/S.S.B.	Lower demodulator panel	OFF
A.G.C. LOWER SLOW/FAST	Lower demodulator panel	FAST
INT. STD. PHASE/TEMP.	Upper converter panel	TEMP.
INTERNAL STANDARD ADJUSTMENT	Upper converter panel	(DO NOT ADJUST)
FREQ. STANDARD EXT./INT.	Upper converter panel	INT. STD.
TUNING (.5 KC/CONT.)	Upper converter panel	.5 KC.
TUNING $\Delta F = 100$ KC (MC)	Lower converter panel	02.0
H.F. ADJ.	Lower converter panel	Center
BAND	Lower converter panel	2-4
TUNING (KC)	Lower converter panel	00.0
R.F. GAIN	Lower converter panel	0
ANT. COMP.	Lower converter panel	0
ANT. CPLG.	Lower converter panel	NOR.

and test measurements may be made at each subassembly through the use of the drawer-tilting mechanisms.

c. SUBASSEMBLY SYMBOL NUMBERS.— Symbol reference designations for all parts in a particular subassembly are grouped numerically for that subassembly. The series of number groups assigned to the subassemblies in the receiver are given in table 5-1.

5-3. OVER-ALL TROUBLE-SHOOTING.

a. PRELIMINARY CHECK.— Before following the detailed trouble-shooting procedure provided for each subassembly, check the panel controls for proper setting; inspect the equipment for blown fuses and faulty antenna or headphone connections; and look for indications of damage, such as broken wires or charred insulation. Refer to the check-off procedures given in NAVSHIPS 91828, particularly paragraph 3-3, "Testing Techniques and Practices."

b. CONTROL SETTINGS.— A list of panel control settings is given in table 5-2. These preliminary settings are in preparation for trouble-shooting the receiver. Readjust individual controls as required when trouble-shooting specific sections of the equipment.

c. SYSTEM TROUBLE-SHOOTING CHART.— Table 5-3, the system trouble-shooting chart, describes a step procedure for localizing the trouble to either the converter or the demodulator drawer. By a process of elimination, the particular subassembly or circuit section at fault may be determined.

5-4. FUNCTIONAL TROUBLE-SHOOTING.

a. GENERAL.— The paragraphs which follow in this section provide individual instructions for trouble-shooting each subassembly of the receiver. Included are trouble-shooting charts, functional schematic diagrams, photographs showing the location of parts and test points, and tables of voltage and resistance measurements.

b. TEST POINT SYMBOLS.— For the purpose of rapid identification of circuit test points, symbols are provided in trouble-shooting tables and schematic diagrams throughout the manual. They have the following significance:

1	Indicates a major test point for checking circuit function and localizing trouble or a major measuring point for signal or power-supply voltages.
1A	Indicates a secondary test point for isolating faults within a major section and to indicate adjustments. The numeral relates to a major point.
1A1	Indicates a minor test point within a secondary section. The first numeral relates to a major point, the letter to a secondary point.

WARNING

Potentials as high as 210 volts rms are present in the power-supply circuits. Avoid contact when checking any of the subassemblies.

TABLE 5-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, SYSTEM TROUBLE-SHOOTING CHART

STEP	ACTION	NORMAL INDICATION	PROBABLE FAULT LOCATION
1	Throw POWER switch ON. Wait 30 seconds. Tune receiver to 02.0 mc.	MEGACYCLE and KILOCYCLE counters light.	Fuse F601.
2	Adjust TUNING ΔF = 100 KC for dip on 100 KC TUNING meter.	100 KC TUNING meter shows dip at 02.0 on MEGACYCLE counter.	Meter or switch; if not, refer to par. 5-11, Injection IF Amplifier.
3	Adjust TUNING (ΔF = 0.5 KC) for dip on .5 KC TUNING meter.	.5 KC TUNING meter shows dip at 00.0 on KILOCYCLE counter.	Meter or switch; if not, refer to par. 5-11.
4	Adjust TUNING ΔF = 100 KC and TUNING (ΔF = 0.5 KC) for reception of a local AM signal. Place TUNING .5 KC/CONT. switch in CONT. position if necessary.	Maximum reading on the RESONANCE meter.	Refer to par. 5-8, 5-9, 5-13, and 5-15.
5	Turn the A.M. A.F. LEVEL control clockwise.	LINE A OUTPUT meter indicates the level, and a signal is heard in the speaker.	Demodulator unit; see par. 5-13.
6	Place RECEPTION switch in the S.S.B. position and turn the A.F. LEVEL LINE A control clockwise.	LINE A OUTPUT meter indicates the level, and a signal is heard in the speaker but is distorted and requires adjustment of the TUNING (ΔF = 1 KC) control to remove the distortion.	USB section; see par. 5-17.
7	Place the A.F. LEVEL LINE A control at 0 and turn the AF LEVEL LINE B control clockwise.	LINE B OUTPUT meter indicates the level, and the signal in the speaker is similar to that in step 6.	LSB section; see par. 5-21.

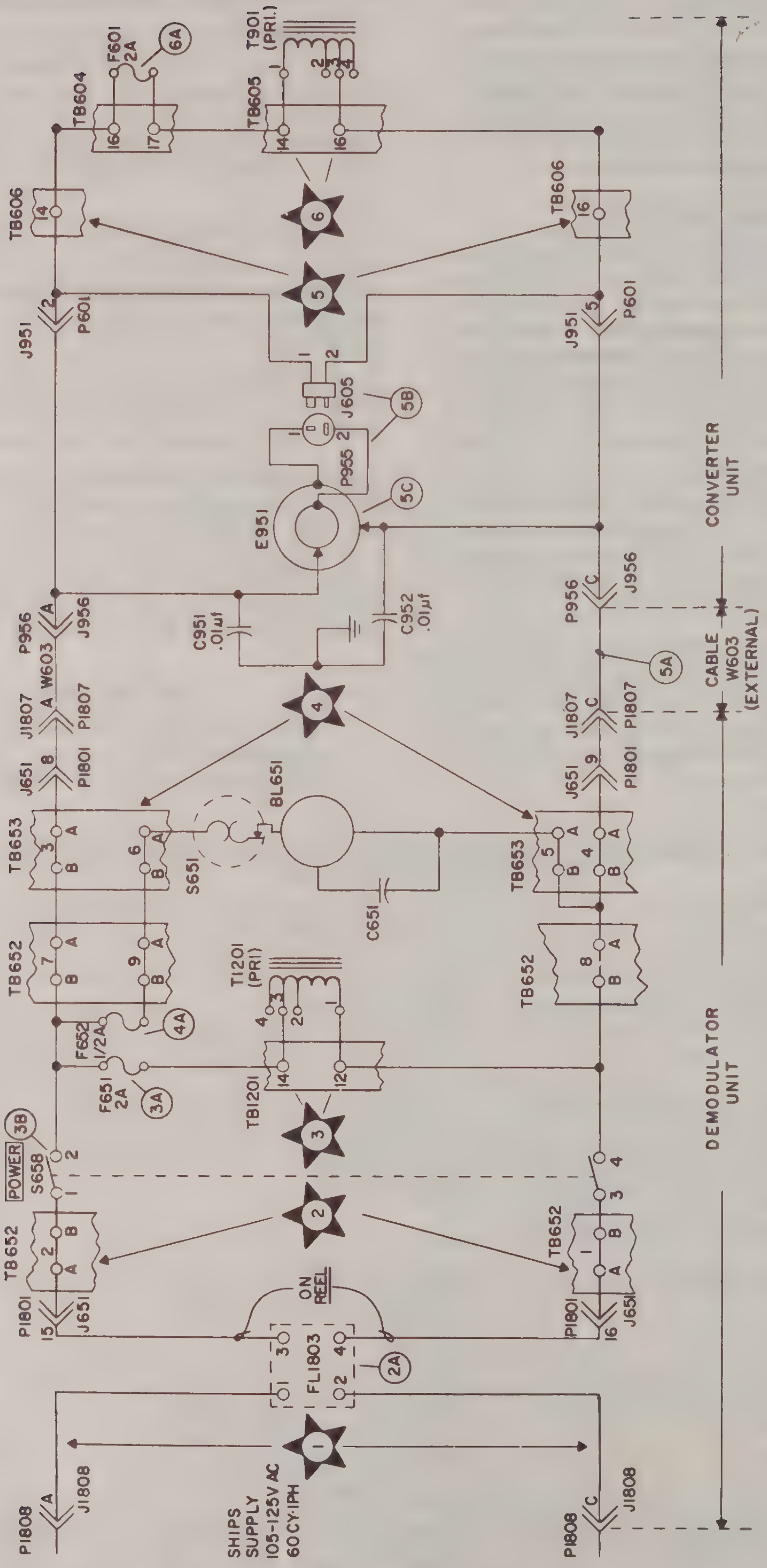

P1808
A
J1808
SHIPS
SUPPLY
105-125V AC
60CY·1PH
1
P1808
C
J1808
FL1803
1
2
3
4
2A
ON
REEL
P1801
15
J651
16
TB652
2
A
B
1
2
POWER
S658
1
2
3
4
3B
3
TB1201
14
12
F651
2A
3A
F652
1/2A
4A
T1201
(PRI)
4
3
2
1
TB652
7
9
8
A
B
TB653
3
6
5
4
A
B
S651
BL651
C651
J651
8
9
P1801
J1807
A
C
P1807
W603
P956
J956
A
C
4
C951
.01µf
C952
.01µf
E951
5C
5A
P955
1
2
J605
5B
1
2
J951
P601
2
5
5
6
TB606
14
16
TB604
16
17
F601
2A
6A
TB605
14
16
T901
(PRI.)
1
2
3
4
DEMODULATOR
UNIT
CABLE
W603
(EXTERNAL)
CONVERTER
UNIT

Figure 5—1. Radio Receiving Sets AN/WRR-2A & AN/FRR-59A Power-Distribution Diagram

5-5. PRIMARY POWER SECTION.

a. GENERAL.— Figure 5-1 is a power-distribution diagram of the receiver. When tracing the power circuits, make certain that the main power is being supplied.

b. TEST EQUIPMENT AND SPECIAL TOOLS.— Use a Multimeter AN/PSM-4B or equivalent in trouble-shooting the primary power circuits. No special tools are required.

c. CONTROL SETTINGS.— Set the panel controls as described in table 5-2.

d. PRIMARY POWER TROUBLE-SHOOTING CHART.— Table 5-4 is a trouble-shooting chart for the primary power section. Perform the steps in the order shown. Compare the results with those listed in the NORMAL INDICATION column. If an indication is normal, proceed to the next step; if abnormal, follow the instructions given in the NEXT STEP column. To

TABLE 5-4. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, PRIMARY POWER TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	1 Figs. 5-1 5-80 5-81	Place POWER switch S658 in ON position.	MEGACYCLE and KILOCYCLE counters light. Axial fan BL651 may or may not operate.[1]	If the counters do not light, check fuse F601.
2	2 Figs. 5-1 5-80 5-81	Connect multimeter between terminals 1 and 2 of TB652.	105 to 125 vac	If normal readings are not obtained, refer to par. 5-23, Demodulator Blister.
3	3 3A 3B Figs. 5-1 5-5 5-6	Connect multimeter between terminals 12 and 14 of TB1201.	105 to 125 vac	If normal readings are not obtained, check fuse F651. If fuse F651 is good, check POWER switch S658.
4	4 4A Figs. 5-1 5-80 5-81	Connect multimeter between terminals 5 and 6 of TB653.	105 to 125 vac	If normal reading is not obtained, check fuse F652. If fuse is good and the axial fan is not operating, refer to par. 6-5*d*(3), Axial Fan Maintenance.[1]

TABLE 5-4. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, PRIMARY POWER TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5	5	Connect multimeter between terminals 14 and 16 of TB606.	105 to 125 vac	If normal reading is not obtained, check cable W603[2] and reel E951.
	5A			Also check P955 and J605.
	5B			
	5C Figs. 5-1 5-77 5-78			
6	6	Connect multimeter between terminals 14 and 16 of TB605.	105 to 125 vac	If a normal reading is not obtained, check fuse F601.
	6A Figs. 5-1 5-2			

[1] Axial fan operation is controlled by thermostat switch S660. This switch opens below 86°F and closes above 112°F ±5°.

[2] When the converter drawer is extended, jack J951 is withdrawn from plug P601 and ac power is supplied to the converter by connector P955-J605. Refer to par. 5-22, Converter Blister, for details of reel E951.

reach the terminal boards for voltage measuring, pull out the related drawer all the way and lock it there.

5-6. CONVERTER POWER SUPPLY.

a. FUNCTION.— The converter power supply provides plate and filament voltages for operating local oscillators, RF and IF amplifiers, and frequency-standard circuits. Faulty operation will cause erratic operation or will disable the receiver entirely. Figure 5-2 is a functional schematic diagram of the converter power supply; figure 5-3 shows the location of parts.

b. PRELIMINARY CHECK.— Before performing the trouble-shooting steps of table 5-5, carefully inspect the power supply, especially the following:

(1) Cable connections at TB604, TB605, and TB606

(2) Seating of tubes V902 and V903 in their sockets

(3) Clamping of plug-in capacitors C901 and C902 in their sockets.

WARNING

Potentials as high as 210 volts rms are present in the power-supply circuits. Avoid contact.

c. TEST EQUIPMENT AND SPECIAL TOOLS.— Use Multimeter AN/PSM-4B or equivalent, set at the range specified in the trouble-shooting step. No special tools are required.

d. CONTROL SETTINGS.— Set the controls to the positions shown in table 5-2.

e. CONVERTER POWER SUPPLY TROUBLE-SHOOTING CHART.— Table 5-5 is a trouble-shooting chart for the converter power supply. Perform the steps in the order shown and compare the results with those

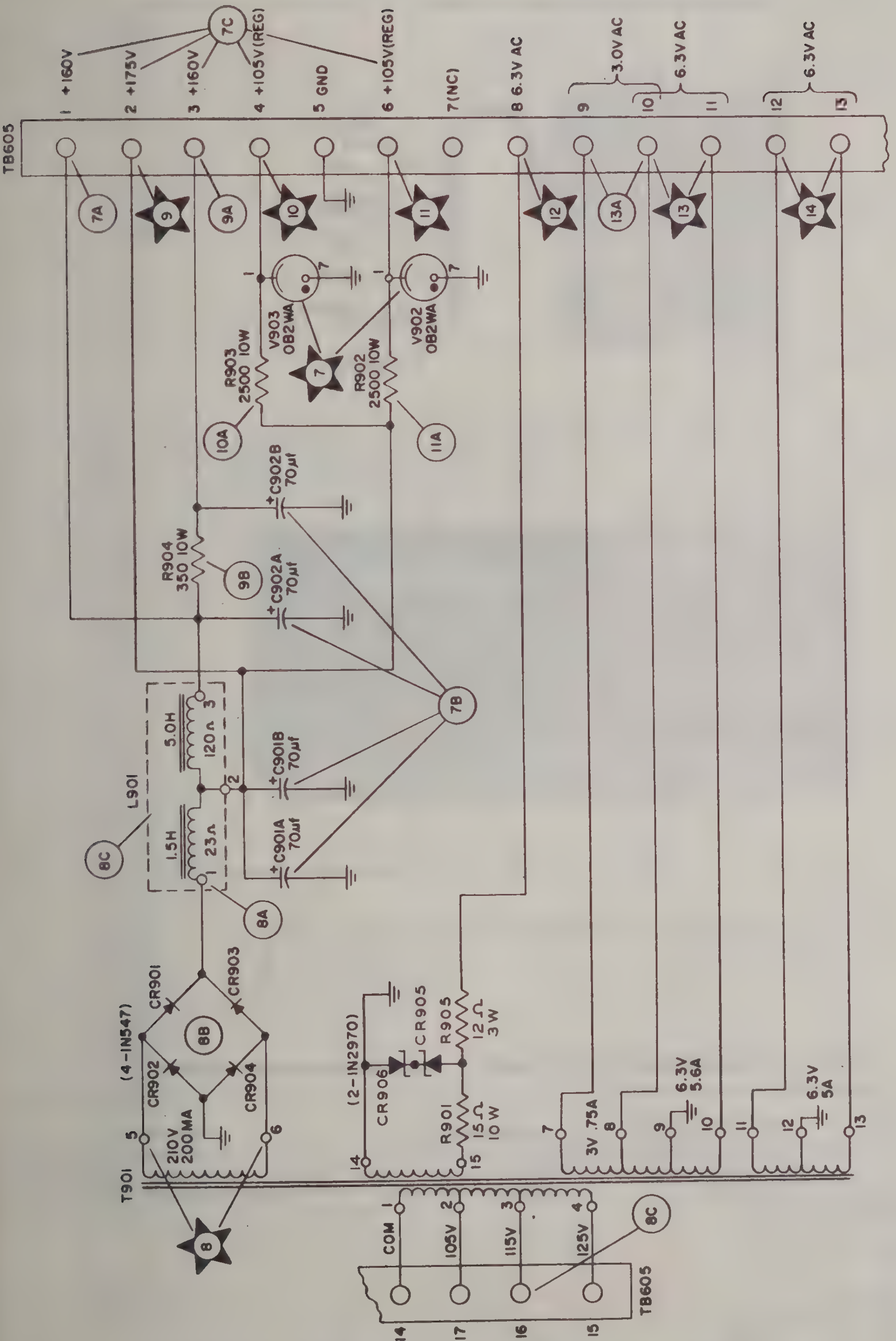

TB605
1 +160V
2 +175V
3 +160V
4 +105V(REG)
5 GND
6 +105V(REG)
7(NC)
8 6.3V AC
9
10
11
12
13
3.0V AC
6.3V AC
6.3V AC
7C
7A
9
9A
10
11
12
13A
13
14
V903
OB2WA
V902
OB2WA
R903
2500 10W
R902
2500 10W
7
10A
11A
C902B
70µf
R904
350 10W
9B
C902A
70µf
7B
L901
8C
5.0H
120Ω
1.5H
23Ω
C901B
70µf
C901A
70µf
8A
(4-IN547)
CR901
CR903
CR902
CR904
8B
210V
200MA
T901
8
(2-IN2970)
CR906
CR905
R905
12Ω
3W
R901
15Ω
10W
3V .75A
6.3V
5.6A
6.3V
5A
COM
105V
115V
125V
8C
TB605
14
17
16
15

Figure 5–2. Converter Power Supply, Functional Schematic Diagram

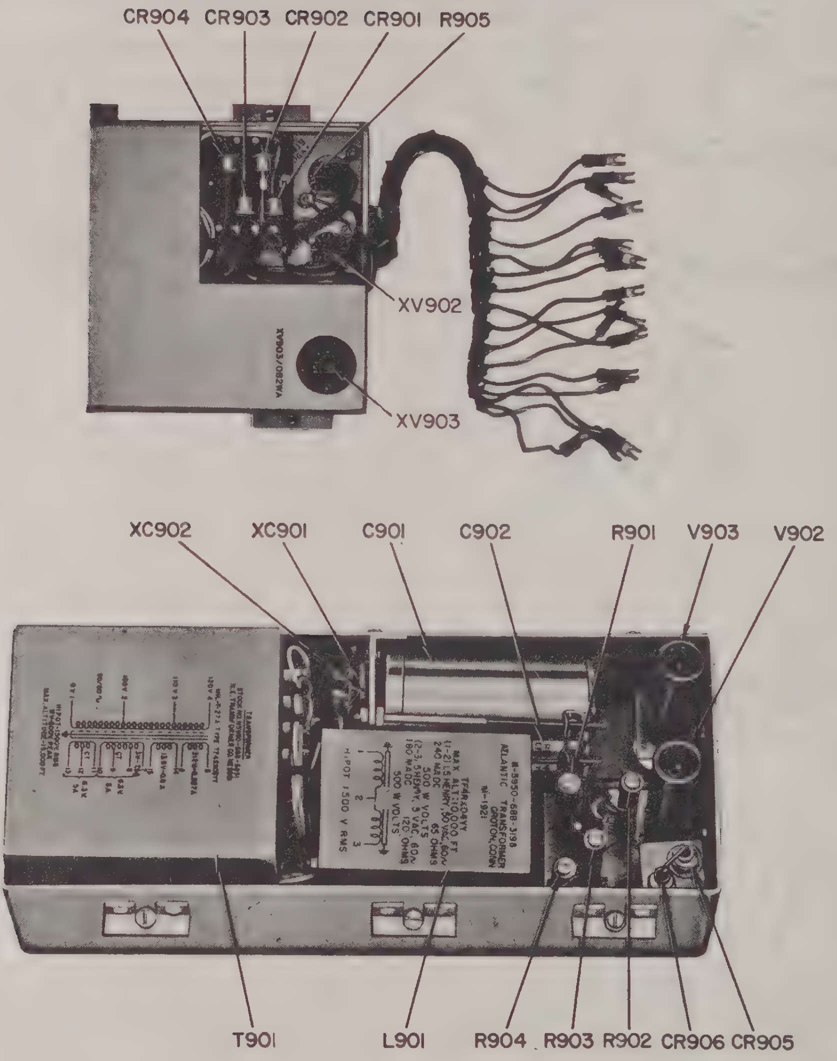

CR904
CR903
CR902
CR901
R905
XV902
XV903
XC902
XC901
C901
C902
R901
V903
V902
T901
L901
R904
R903
R902
CR906
CR905

Figure 5-3. Converter Power Supply, Location of Parts

TABLE 5-5. CONVERTER POWER SUPPLY, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	7 Fig. 5-2 5-3 5-4 Table 6-7	Place POWER switch in ON position.	After 30 seconds, tubes V902 and V903 glow.	If tubes do not glow, perform step 6 in table 5-4, check V902 and V903.

TABLE 5-5. CONVERTER POWER SUPPLY, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
2	7A	Connect multimeter from terminal 1 of TB605 to chassis. Select the 200 vdc range.	+160 vdc ±20% tol.	If reading is normal, proceed to step 7. If reading is absent, proceed to step 3.
3	7B	Replace plug-in capacitors C901 and C902 with new parts and repeat step 2.	+160 vdc ±20% tol.	If reading is normal, proceed to step 7. If reading is the same as step 2, put back original plug-in capacitors and proceed to step 4.
4	7C	Disconnect leads 1, 2, 3, 4, and 6 from TB605 and repeat step 2.	+180 vdc ±20% tol.	If reading is slightly above normal, trouble is not in converter power supply but in subassemblies served by supply. If reading is absent, proceed to step 5.
5	8 Figs. 5-2 5-3 5-4 Table 6-7	Connect multimeter across terminals 5 and 6 of T901. Select the 400 vac range.	210 vac ±20% tol.	If reading is normal, proceed to step 6; if abnormal, see if proper T901 primary terminals are in use for the ship's supply voltage. If no reading, T901 is defective; refer to par. 6-5*b*(11).
6	8A 8B 8C	Connect multimeter from terminals 1 of L901 to chassis. Select the 400 vdc range.	+180 vdc ±20% tol.	If low, or no, reading is obtained, check rectifiers CR901, CR902, CR903, and CR904. One or more are defective. See par. 6-5*b*(11). If reading is normal, one or more sections of L901 are open.
7	9 7C Figs. 5-2 5-3 5-4	Reconnect leads 1, 2, 3, 4, and 6 to TB605 (if removed). Connect multimeter from terminal 2 of TB605 to chassis. Select the 200 vdc range.	+175 vdc, ±20% tol.	If reading is absent, inspect power supply wiring for open lead, repeat step 2.
8	9A 9B	Connect multimeter from terminal 3 of TB605 to chassis. Select the 200 vdc range.	+160 vdc ±20% tol.	If reading is abnormal, check resistor R904. Also, trouble can be in crystal oscillator subassembly. Remove lead 3 from terminal board TB605 and measure R904 with ohmmeter. WARNING Turn off power before checking R904.

TABLE 5-5. CONVERTER POWER SUPPLY, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
9	10 7 10A Figs. 5-2 5-3 5-4 Table 6-7	Connect multimeter from terminal 4 of TB605 to chassis. Select the 200 vdc range.	+105 vdc ±5% tol.; V903 glows.	If 903 does not glow, replace tube. If replacing tube does not give normal indication, remove lead to terminal 4 of TB605. If indication is now normal, the trouble is in the crystal oscillator or interpolation subassembly. If removing lead 4 does not give normal indication, R903 is defective; replace. Return lead to terminal 4 of TB605.
10	11 7 11A Figs. 5-2 5-3 5-4	Connect multimeter from terminal 6 of TB605 to chassis. Select the 200 vdc range.	+105 vdc ±5% tol.; V902 glows.	If V902 does not glow, replace tube. If replacing tube does not give normal indication, remove lead to terminal 6 of TB605. If indication is now normal, trouble is in HF oscillator subassembly. If removing lead 6 does not give normal indication, R902 is defective; replace. Return lead to terminal 6 of TB605.
11	12 12A 12B Figs. 5-2 5-3 5-4	Connect multimeter from terminal 8 of TB605 to chassis. Select the 10 vac range.	6.3 vac ±10% tol.	If reading is too high, check tube V301 in the HF oscillator for open heater. Also check CR905 and CR906 for an open condition. If no reading is obtained R901 or R905 is defective.
12	13 Figs. 5-2 5-3 5-4 Table 6-7	Connect multimeter between terminals 10 and 11 of TB605. Select the 10 vac range.	6.3 vac ±20% tol.	A no-voltage reading accompanied by extreme heating of cable leads indicates a short circuit in the filament circuit. Also check secondary of T901 (pins 8 and 10) for an open circuit.

TABLE 5-5. CONVERTER POWER SUPPLY, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
13	13A	Connect multimeter from terminal 9 of TB605 to chassis. Select the 10 vac range.	6.15 vac ±20% tol.	No voltage reading shows the same trouble as in step 12. At T901, check for open winding at pins 7 and 9.
14	14 Figs. 5-2 5-3 5-4	Connect multimeter between terminals 12 and 13 of TB605. Select the 10 vac range.	6.3 vac ±20% tol.	A no-voltage reading indicates the same trouble as in step 12. At T901, check for open winding at pins 11 and 13.

shown in the NORMAL INDICATION column. If indications are abnormal, follow the instructions given in the NEXT STEP column. Figure 5-4 shows the location of test points. Table 6-7 provides voltage and resistance measurements at the tube sockets. Make voltage measurements with the power on, resistance measurements with the power off.

5-7. DEMODULATOR POWER SUPPLY.

a. FUNCTION.— The demodulator power supply provides plate and filament voltages for the operation of the AM, USB, and LSB detector-amplifier circuits of the receiver. Faulty operation of the power supply will cause erratic operation or will disable the receiver completely. Figure 5-5 is a functional schematic diagram; figure 5-6 shows the location of parts.

b. PRELIMINARY CHECK.— Before performing the trouble-shooting steps in table 5-6, inspect the demodulator power supply, especially the following:

(1) Cable connections at TB651, TB652, and TB1201

(2) Clamping of plug-in capacitors C1201 and C1202 in their sockets.

WARNING

Potentials as high as 210 volts rms are present in the power-supply circuits. Avoid contact.

c. TEST EQUIPMENT AND SPECIAL TOOLS.— Use Multimeter AN/PSM-4B or equivalent, set to the range specified in each step. No special tools are required.

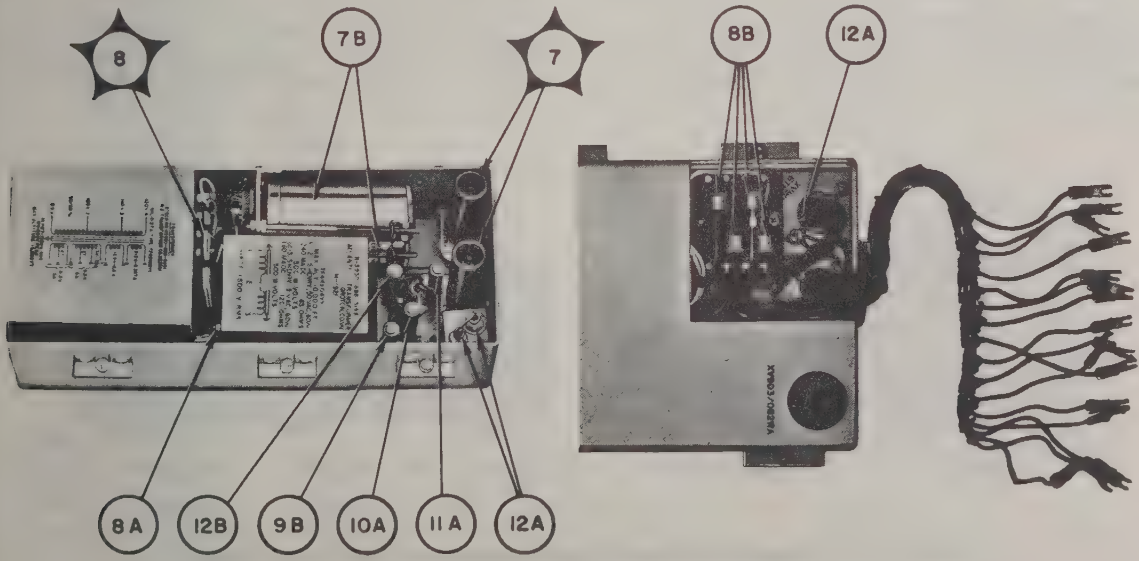


Figure 5-4. Converter Power Supply, Location of Test Points

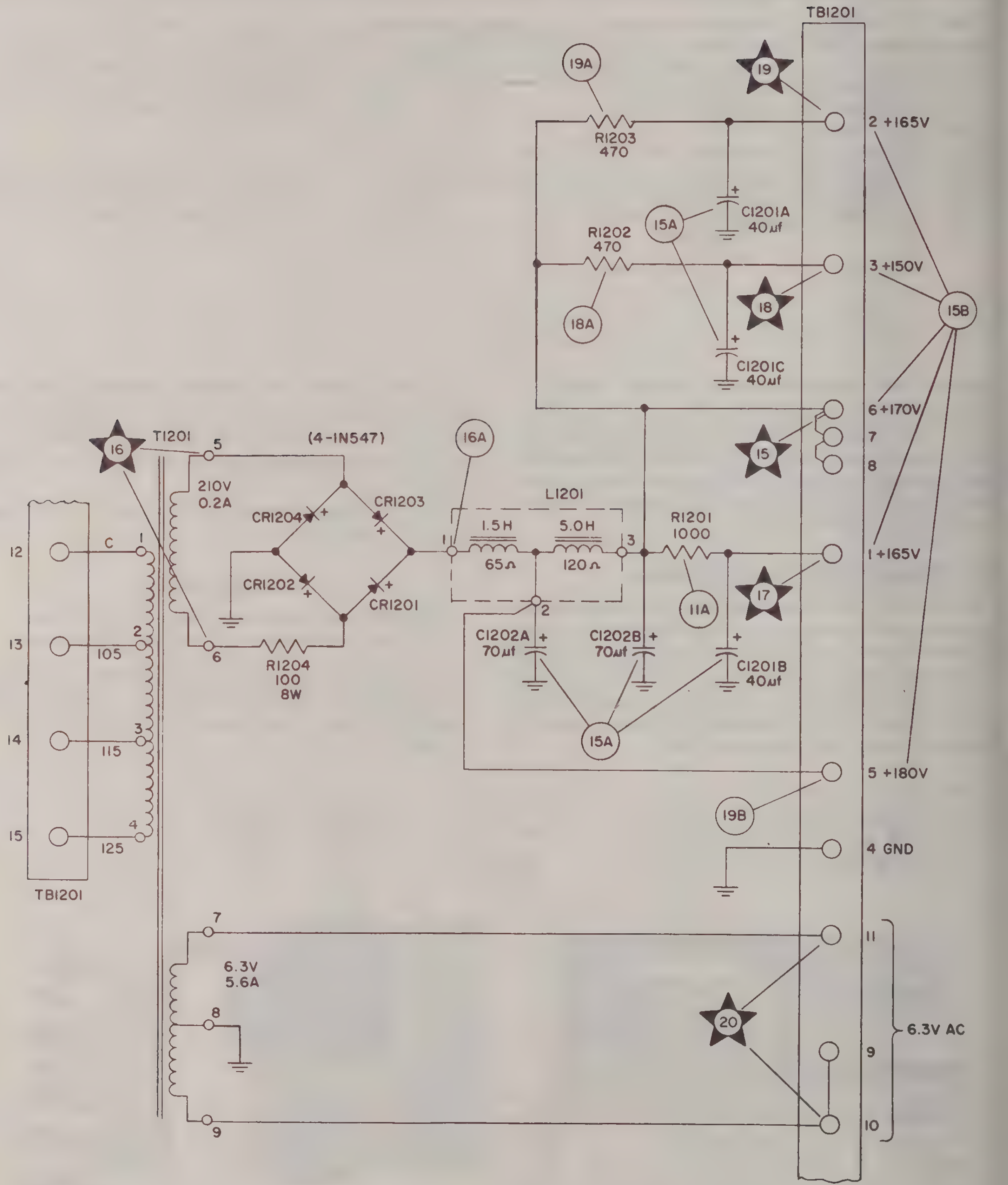

TB1201
19A
19
R1203
470
2 +165V
C1201A
40µf
15A
R1202
470
3 +150V
18
18A
15B
C1201C
40µf
6 +170V
7
8
15
16
T1201
5
(4-IN547)
16A
210V
0.2A
CR1203
L1201
CR1204
1.5H
5.0H
R1201
1000
12
C
1
65Ω
120Ω
3
1 +165V
CR1202
CR1201
2
11A
17
13
2
105
6
R1204
100
8W
C1202A
70µf
C1202B
70µf
C1201B
40µf
14
3
115
15A
15
4
125
5 +180V
TB1201
19B
4 GND
7
11
6.3V
5.6A
20
6.3V AC
8
9
9
10

Figure 5—5. Demodulator Power Supply, Functional Schematic Diagram

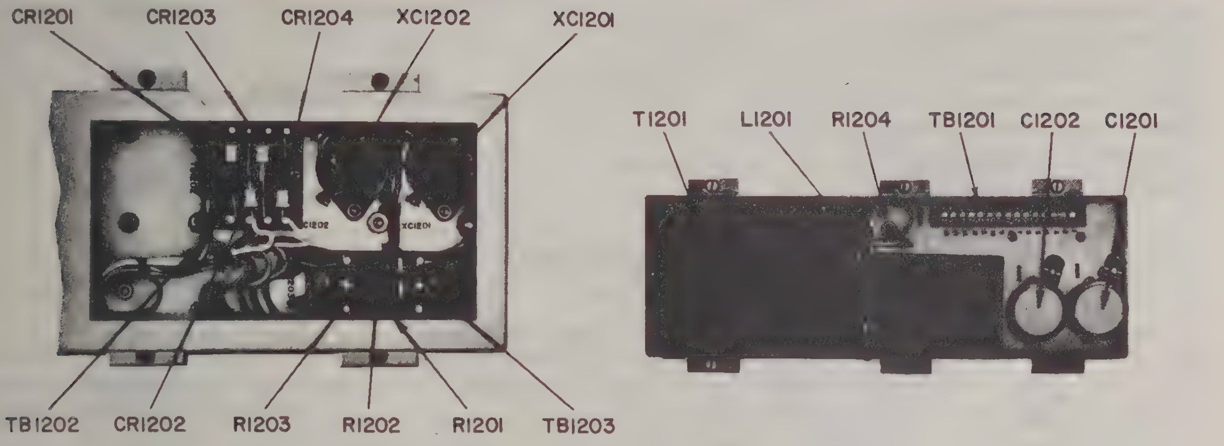


Figure 5-6. Demodulator Power Supply, Location of Parts

d. CONTROL SETTINGS.— Place the panel controls in the positions shown in table 5-2.

e. DEMODULATOR POWER SUPPLY TROUBLE-SHOOTING CHART.— Table 5-6 is the trouble-shooting chart for the demodulator power supply. Perform the steps in the order given and compare the results with those listed in the NORMAL INDICATION column. If an indication is abnormal, follow the instructions given in the NEXT STEP column. Figure 5-7 shows the location of test points.

5-8. ANTENNA COUPLER.

a. FUNCTION.— The antenna coupler provides three steps of signal attenuation at the input of the receiver. It also contains a protective fuse (F2801) in series with the antenna circuit. Faulty coupler operation will reduce the strength of the signal, with the coupler in NOR. position a blown fuse will cut off the signal entirely, preventing reception. Figure 5-8 is a functional schematic diagram of the antenna coupler, and figure 5-9 shows the location of parts. A simplified schematic diagram of the coupler may be found in figure 4-6.

b. PRELIMINARY CHECK.— With the power off, inspect the antenna circuit cabling before trouble-shooting the coupler. Examine the fuse. With an ohmmeter, test the signal circuit from the antenna input connector (J957) to the antenna coupler connector (J2802) to establish the continuity of the signal path and the absence of short circuits in the cables or connectors.

c. TEST EQUIPMENT AND SPECIAL TOOLS.— Use Multimeter AN/PSM-4B or equivalent. No special tools are required.

d. CONTROL SETTINGS.— The ANT. CPLG. switch (S2801) is the only control used in this test.

e. ANTENNA COUPLER TROUBLE-SHOOTING. — Figure 5-8 shows separate functioning circuits for each position of the ANT. CPLG. switch. Disconnect

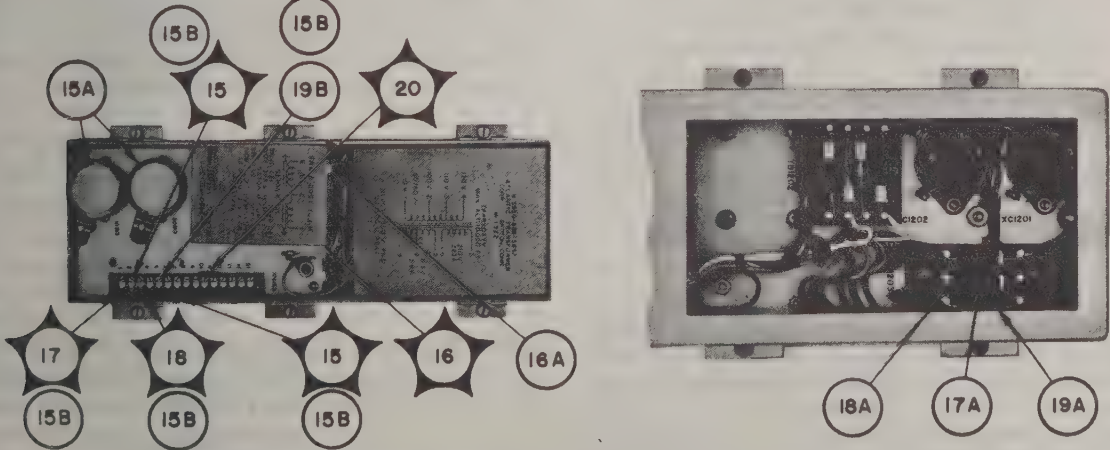


Figure 5-7. Demodulator Power Supply, Location of Test Points

the coax cables at J2802 and J2801. With the multimeter set at the R x 1 multiplier range, measure the circuit resistance from J2802 to J2801 and from J2801 to ground for each position of the ANT. CPLG. switch. Figure 5-10 shows the location of test points.

(1) Normal indications for the ★21 measurement, J2802 to J2801, are as follows:

Position	*Resistance (ohms)*
NOR.	0
1	560 ±10%
2	560 ±10%
3	642 ±10%

TABLE 5-6. DEMODULATOR POWER SUPPLY, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	★15 Figs. 5-5 5-6 5-7	Connect multimeter from terminal 6 of TB1201 to chassis. Select the 200 vdc range. Place POWER switch in the ON position.	+170 vdc ±20% tol.	If reading is normal, proceed to step 6. If reading is low or absent, proceed to step 2.
2	(15A)	Replace plug-in capacitors C1201 and C1202.	+170 vdc ±20% tol.	If reading is normal, proceed to step 6. If reading is the same as step 1, put back the original plug-in capacitors and proceed to step 3.
3	(15B)	Disconnect leads 1, 2, 3, 5, and 6 from TB1201 and repeat step 1.	+185 vdc ±20% tol.	If reading is slightly above normal, the trouble is not in the demodulator power supply but in subassemblies served by the supply. If reading is the same as in step 1, proceed to step 4.
4	★16 Figs. 5-5 5-6 5-7	Connect multimeter across terminals 5 and 6 of T1201. Select the 400 vac range.	210 vac ±20% tol.	If reading is abnormal, make certain that proper primary taps are used on T1201. If there is no reading, T1201 is defective; refer to par. 6-5*c*(5).
5	(16A)	Connect multimeter from terminal 1 of L1201 to chassis. Select the 400 vdc range.	+185 vdc ±20% tol.	If low or no reading is obtained, rectifiers CR1201, CR1202, CR1203, and CR1204 are suspect. One or more are defective. If reading is normal, one or more sections of L1201 are open. Refer to par. 6-5*c*(5).
6	★17 Figs. 5-5 5-6 5-7	Reconnect leads 1, 2, 3, 5, and 6 to TB1201 (if removed). Connect multimeter from terminal 1 of TB1201 to chassis. Select the 200 vdc range.	+165 vdc ±20% tol.	If reading is abnormal, suspect R1201. The trouble can also be in the AM detector-amplifier. Remove lead 1 from TB1201 and measure R1201 with ohmmeter. WARNING Turn off power before checking R1201.
7	★18 (18A)	Connect multimeter from terminal 3 of TB1201 to chassis. Select the 200 vdc range.	+150 vdc ±20% tol.	If reading is abnormal, suspect R1202. The trouble can also be in the USB detector-amplifier. Remove lead 3 from TB1201 and measure R1202 with ohmmeter. WARNING Turn off power before checking R1202.

TABLE 5-6. DEMODULATOR POWER SUPPLY, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
8	★19 19A Figs. 5-5 5-6 5-7	Connect multimeter from terminal 2 of TB1201 to chassis. Select the 200 vdc range.	+165 vdc ±20% tol.	If reading is abnormal, suspect R1203. The trouble can also be in the LSB detector-amplifier. Remove lead 2 from TB1201 and measure R1203 with ohmmeter. WARNING Turn off power before checking R1203.
9	19B	Connect multimeter from terminal 5 on TB1201 to chassis. Select the 200 vdc range.	+180 vdc ±20% tol.	If there is no reading, check terminal 5 lead wiring.
10	★20 Figs. 5-5 5-6 5-7	Connect multimeter between terminals 10 and 11 of TB1201. Select the 10 vac range.	6.3 vac ±20% tol.	If reading is very low or absent, inspect cables for evidence of overheating caused by short circuit in power supply or in subassemblies served by this filament winding. Check T1201 for an open secondary winding (pins 7 and 9).

(2) Normal indications for the ★22 measurements, J2801 to ground, are:

Position	*Resistance (ohms)*
NOR.	Infinity
1	220 ±10%
2	9 ±10%
3	9 ±10%

When the ANT. CPLG. switch is in NOR. position, all resistors are disconnected. If an attenuator resistor is suspected of being defective, it should be measured directly at switch S2801 to verify the initial measurements.

5-9. PRESELECTOR.

a. FUNCTION.— The preselector consists of the first and second RF amplifier stages and the first conversion mixer stage. Faulty operation of the preselector can reduce the strength of received signals or prevent reception completely. Figure 5-11 is a functional schematic diagram of the preselector.

b. ACCESS.— The preselector is located in the lower converter deck. To expose it, pull out the converter drawer and raise the upper deck. Figure 5-12 shows the location of parts.

c. PRELIMINARY CHECK.— With the power off, make a preliminary inspection of the preselector before beginning trouble-shooting, with emphasis on the following:

(1) Seating of tubes V51, V101, and V151 in their sockets

(2) Cable connections at J51, J102, J151, J153, and J154

(3) Soldered connections at chassis feed-through terminals.

WARNING

Potentials as high as 210 volts rms are present in the power-supply circuits. Avoid contact.

d. TEST EQUIPMENT AND SPECIAL TOOLS.— Use Multimeter AN/PSM-4B, VTVM ME-30/U, and Signal Generator AN/URM-25D, or their equivalent. No special tools are required.

e. CONTROL SETTINGS.— Set the panel controls to the positions shown in table 5-2.

f. PRESELECTOR TROUBLE-SHOOTING CHART.— Trouble-shooting the preselector consists of measuring the initial supply voltages and tracing signals through the circuits. Table 5-7 is the trouble-shooting chart for the preselector. Figure 5-13 shows the location of test points. Table 6-5 gives voltage and resistance measurements. Follow the steps of table 5-7 in the order shown and compare the results with those in

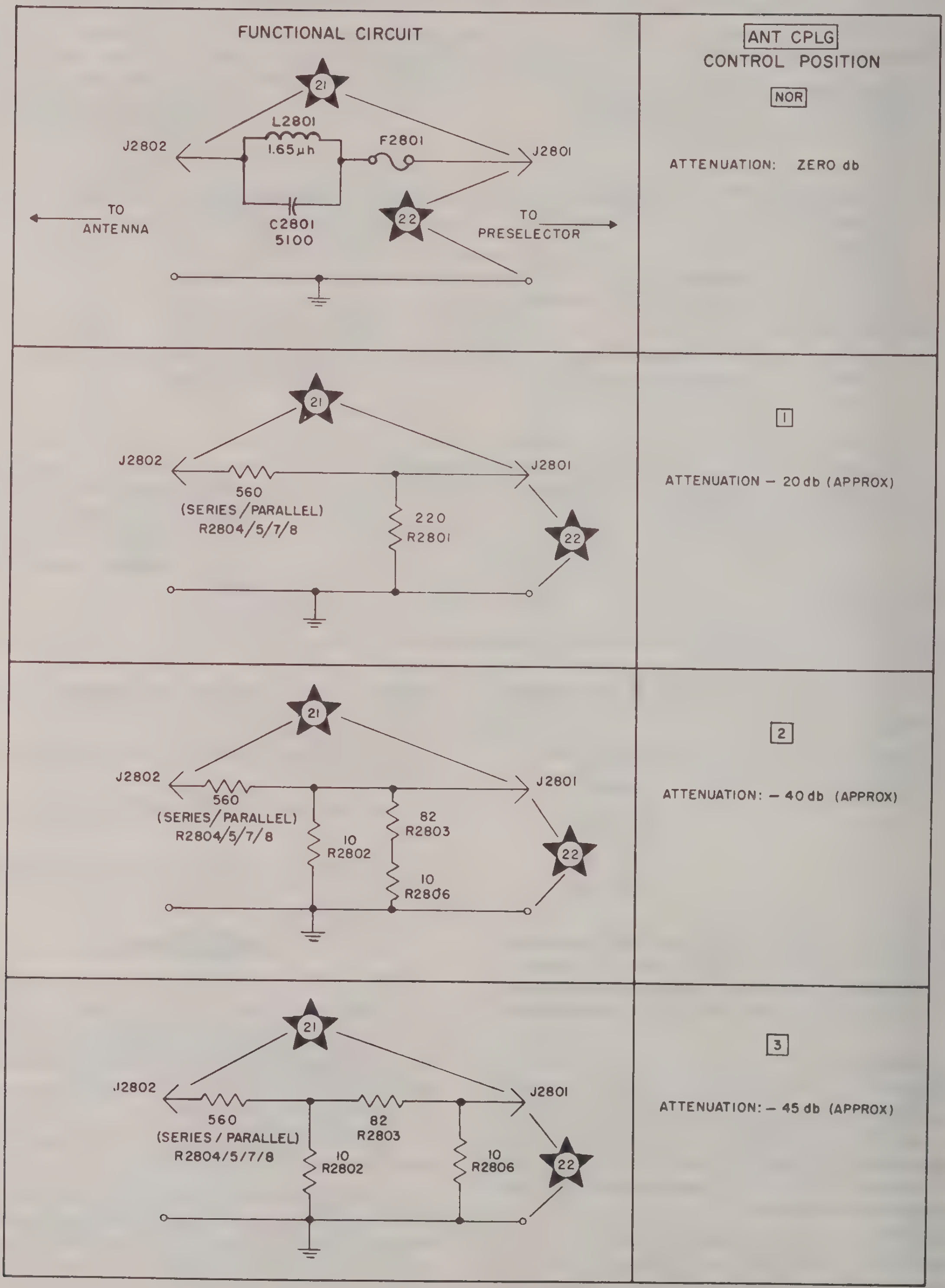

FUNCTIONAL CIRCUIT
ANT CPLG
CONTROL POSITION
NOR
ATTENUATION: ZERO db
21
L2801
1.65μh
F2801
J2802
J2801
22
TO
ANTENNA
C2801
5100
TO
PRESELECTOR
1
ATTENUATION – 20 db (APPROX)
21
J2802
J2801
560
(SERIES/PARALLEL)
R2804/5/7/8
220
R2801
22
2
ATTENUATION: – 40 db (APPROX)
21
J2802
J2801
560
(SERIES/PARALLEL)
R2804/5/7/8
10
R2802
82
R2803
10
R2806
22
3
ATTENUATION: – 45 db (APPROX)
21
J2802
J2801
560
(SERIES / PARALLEL)
R2804/5/7/8
82
R2803
10
R2802
10
R2806
22

Figure 5–8. Antenna Coupler, Functional Schematic Diagram

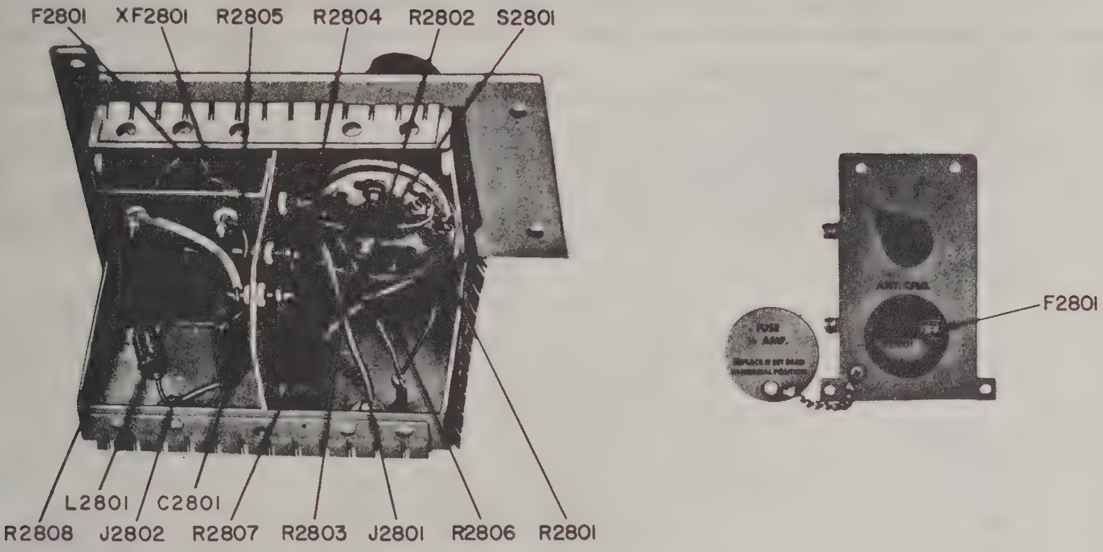


Figure 5-9. Antenna Coupler, Location of Parts

the NORMAL INDICATION column. If an indication is abnormal, follow the instructions given in the NEXT STEP column.

5-10. TUNABLE IF FILTER.

a. DIAGRAMS.— Figure 5-14 is a functional schematic diagram of the tunable IF filter. Refer also to figure 5-11, the functional schematic diagram of the preselector, because the plate circuit load for V151, the preselector mixer stage, is part of the tunable IF filter circuit. Figure 5-15 shows the location of parts of the tunable IF filter and figure 5-16 the location of test points.

b. PRELIMINARY CHECK.— Before trouble-shooting the tunable IF filter, inspect the following:

(1) Input and output connectors J351 and J352

(2) Soldered connections at chassis feed-through E351.

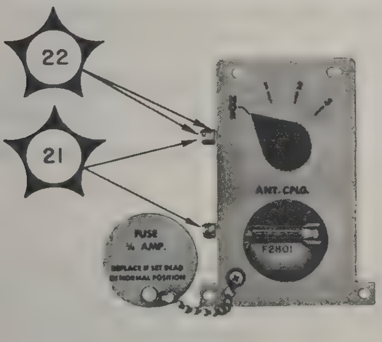


Figure 5-10. Antenna Coupler, Location of Test Points

c. TEST EQUIPMENT AND SPECIAL TOOLS.— Use Multimeter AN/PSM-4B, VTVM ME-30/U, and RF Signal Generator AN/URM-25D or their equivalent. No special tools are required.

d. CONTROL SETTINGS.— Set the panel controls to the positions shown in table 5-2.

e. TUNABLE IF FILTER TROUBLE-SHOOTING. — The operation of the tunable IF filter is tested with receiver power off and cables removed from the input and output connectors J351 and J352. DC supply measurements are made with the power on.

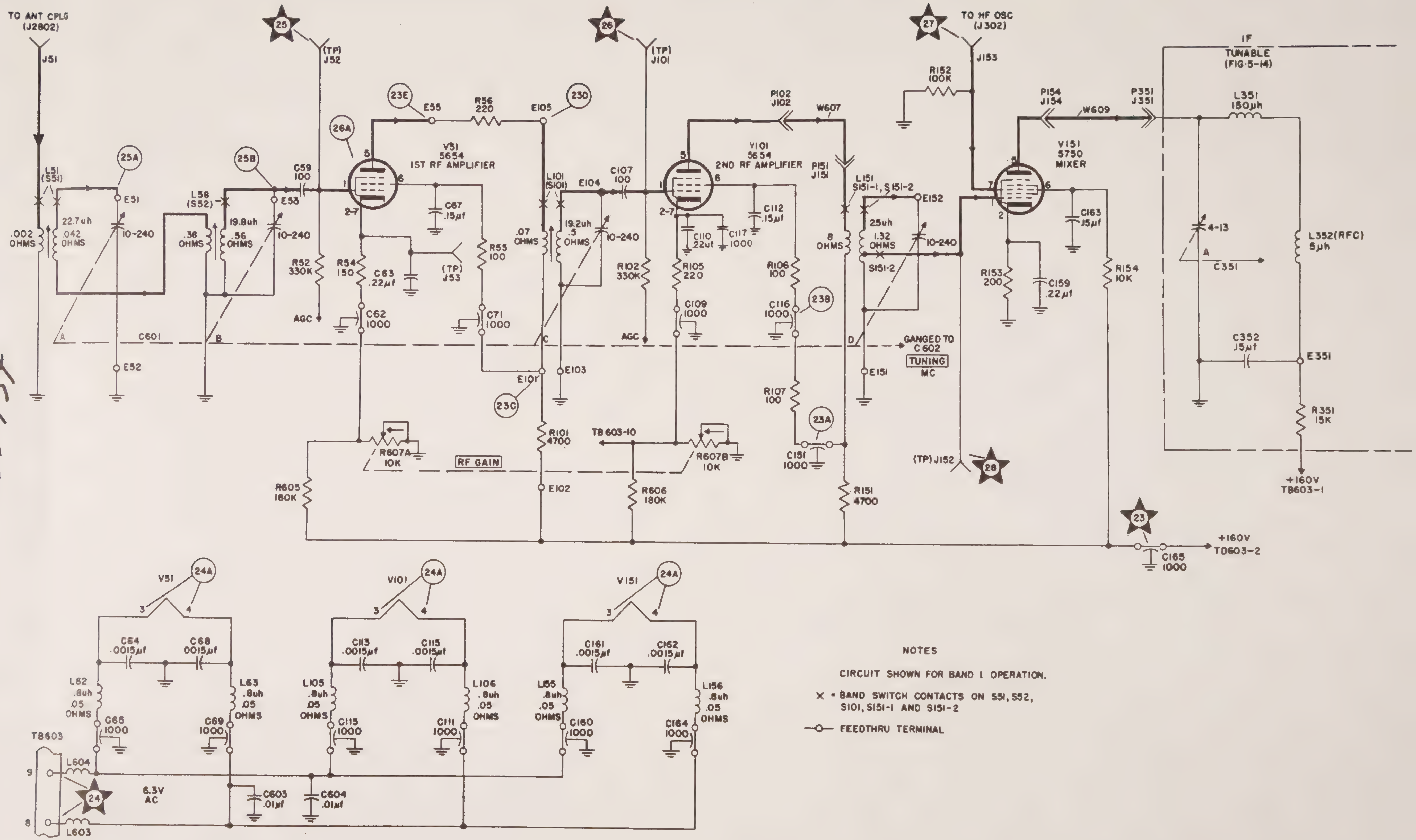
(1) TEST POINTS ★29, •29A, •29B.— Place POWER switch in ON position and connect the multimeter, set at 200 vdc range, between feed-through terminal E351 and the chassis. The normal indication is 120 vdc ±20% tol. If there is no reading try terminal 1 of TB603. The normal indication here is 160 vdc ±20% tol. If the indication is normal, place the POWER switch in OFF position and check the continuity of L351 and L352 by measuring between feed-through terminal E351 and the contact of connector J351.

(2) TEST POINTS •29C, •30A.—Turn power OFF and remove J351-J352 cables. Connect the RF signal generator between connector J351 and chassis. Adjust the generator for a 1675 kc signal unmodulated with an output signal of 1.0 v rms. Tune the receiver TUNING (kc) indicator to 50.0 kc.

Connect the VTVM between connector J352 and chassis. A reading of 0.05 v rms is normal. If reading is not normal, remove the tunable IF filter subassembly and check. Removal instructions are given in par. 6-5*b*(3).

TABLE 5-7. PRESELECTOR, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	23 23A to 23E Figs. 5-11 5-12 5-13	Connect multimeter, set at 200 vdc range, between chassis feed-through capacitors and chassis; tolerance ±20%.	C165: +160 vdc	If no voltage is present, perform step 4 in table 5-5. Check capacitor C165. WARNING Turn power off before making ohmmeter measurements.
	23A		C151: +100 vdc	If no voltage is present, check R151 and C151.
	23B		C116: +100 vdc	If no voltage is present, check R107, C116, and C112.
	23C		E101: +100 vdc	If no voltage is present, check R101 and C71.
	23D		E105: +100 vdc	If no voltage is present, check primary winding of L101 (L102, L103, and L104 on Bands 2, 3, 4).
	23E		E55: +100 vdc	If no voltage is present, check R56.
2	24 24A Figs. 5-11 5-12 5-13	Connect multimeter between terminals 8 and 9 of TB603. Select the 10 vac range.	6.3 vac ±20% tol.	If no voltage is present, perform step 12 in table 5-5. If voltage is present but V51, V101, or V151 do not light, check each tube for open heater. If the tube is good, measure 6.3 vac directly at pins 3 and 4 of each socket. If no voltage is present, check related filament chokes L62, L63, L105, L106, L155, and L156. Check related filament bypass capacitors.


TO ANT CPLG (J2802)
J51
25
(TP) J52
23E
E55
R56 220
E105
23D
26
(TP) J101
27
TO HF OSC (J302)
J153
R152 100K
IF TUNABLE (FIG-5-14)
26A
V51 5654 1ST RF AMPLIFIER
V101 5654 2ND RF AMPLIFIER
V151 5750 MIXER
P102 J102
W607
P151 J151
P154 J154
W609
P351 J351
L351 150µh
25A
25B
L51 (S51)
E51
22.7uh
.042 OHMS
.002 OHMS
10-240
L58 (S52)
E53
.38 OHMS
19.8uh
.56 OHMS
C59 100
R52 330K
R54 150
C63 .22µf
C67 .15µf
(TP) J53
R55 100
AGC
C62 1000
C71 1000
C601
A
B
C
D
E52
L101 (S101)
E104
C107 100
.07 OHMS
19.2uh
.5 OHMS
C110 .22µf
C117 1000
C112 .15µf
R102 330K
R105 220
R106 100
C109 1000
C116 1000
23B
E101
E103
23C
R101 4700
E102
TB 603-10
R607A 10K
RF GAIN
R607B 10K
R605 180K
R606 180K
R107 100
23A
C151 1000
R151 4700
L151 S151-1, S151-2
E152
25uh
1.32 OHMS
8 OHMS
S151-2
10-240
E151
GANGED TO C602
TUNING MC
R153 200
C159 .22µf
C163 .15µf
R154 10K
(TP) J152
28
23
4-13
C351
L352(RFC) 5µh
C352 .15µf
E351
R351 15K
+160V TB603-1
+160V TB603-2
C165 1000
V51
V101
V151
24A
C64 .0015µf
C68 .0015µf
C113 .0015µf
C115 .0015µf
C161 .0015µf
C162 .0015µf
L62 .8uh .05 OHMS
L63 .8uh .05 OHMS
L105 .8uh .05 OHMS
L106 .8uh .05 OHMS
L155 .8uh .05 OHMS
L156 .8uh .05 OHMS
C65 1000
C69 1000
C115 1000
C111 1000
C160 1000
C164 1000
TB603
L604
L603
24
6.3V AC
C603 .01µf
C604 .01µf

NOTES

CIRCUIT SHOWN FOR BAND 1 OPERATION.

X = BAND SWITCH CONTACTS ON S51, S52, S101, S151-1 AND S151-2

—○— FEEDTHRU TERMINAL

Figure 5—11. Preselector, Functional Schematic Diagram

ORIGINAL

TABLE 5-7. PRESELECTOR, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
3	25 25A 25B Figs. 5-11 5-12 5-13	Turn receiver power off. Remove V51 from its socket. Connect signal generator between J51 and chassis, adjust for 2.0 mc unmodulated signal (0.25 volt). Tune receiver to 2.0 mc. Measure signal level at test point J52 with VTVM at appropriate rms range, tolerance 10%.	TP J52: 1.7 v rms	If no signal is present, trace the signal at feed-through terminals E51 and E53. Check rf coils L51 and L58 (L52, L53, L54, L59, L60, and L61 on Bands 2, 3, 4). Check coupling capacitor C59.
	26 26A Figs. 5-11 5-12 5-13	Replace V51 in its tube socket and remove V101. Connect signal generator to E105 (generator output is the same as that used in step 3). Measure signal at test point J101 with VTVM.	TP J101: 1.0 v rms	If no signal is present, check L101 and capacitor C107.
	28	Replace V101 in its tube socket and remove V151. Connect generator to J151. Adjust its output for 0.18 v rms. Measure signal at test point J152 with VTVM.	TP J152: 0.8 v rms	If no signal is present, check L151.
4	27	Replace V151 in its tube socket and remove generator. Turn receiver power on. Measure HFO injection signal at test point J153 with VTVM.	J153: .10 v rms	If no signal is present, refer to par. 5-14.

5-11. INJECTION IF AMPLIFIER.

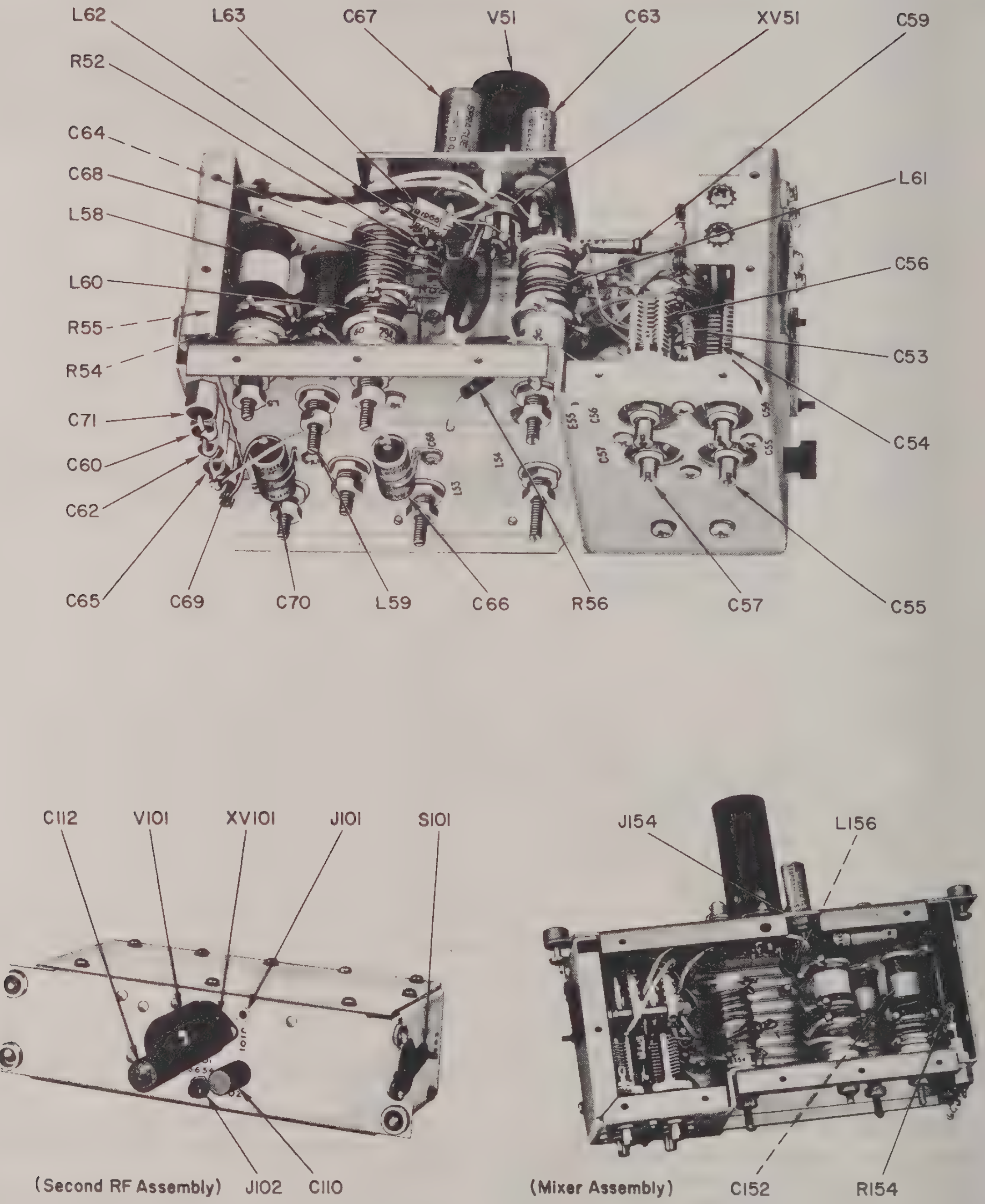
a. DIAGRAMS.— Figure 5-17 is a functional block diagram of the injection IF amplifier. For a complete schematic diagram, refer to figure 6-16. The following functional schematic diagrams of injection IF amplifier are also provided:

Figure	*Diagram*
5-18	1625-1725 and 220 kc IF amplifier
5-19	825 kc injection amplifier
5-20	1405-1505 kc injection amplifier
5-21	140 kc injection amplifier

Figure 5-22 shows the location of parts in the injection IF amplifier and figure 5-23 the location of test points.

b. ACCESS.— The injection IF is located in the lower converter deck. For access to the top, raise the upper deck; for access to the bottom — and to the horizontally positioned tubes, rotate the entire converter drawer to its vertical position.

c. PRELIMINARY CHECK.— With the power off, make a preliminary inspection before trouble-shooting the injection IF, with emphasis on the following:


L62
L63
C67
V51
C63
XV51
C59
R52
C64
C68
L58
L60
R55
R54
C71
C60
C62
L61
C56
C53
C54
C65
C69
C70
L59
C66
R56
C57
C55
C112
V101
XV101
J101
S101
J154
L156
J102
C110
C152
R154

(Second RF Assembly)

(Mixer Assembly)

Figure 5—12. Preselector, Location of Parts
(Sheet 1 of 3)

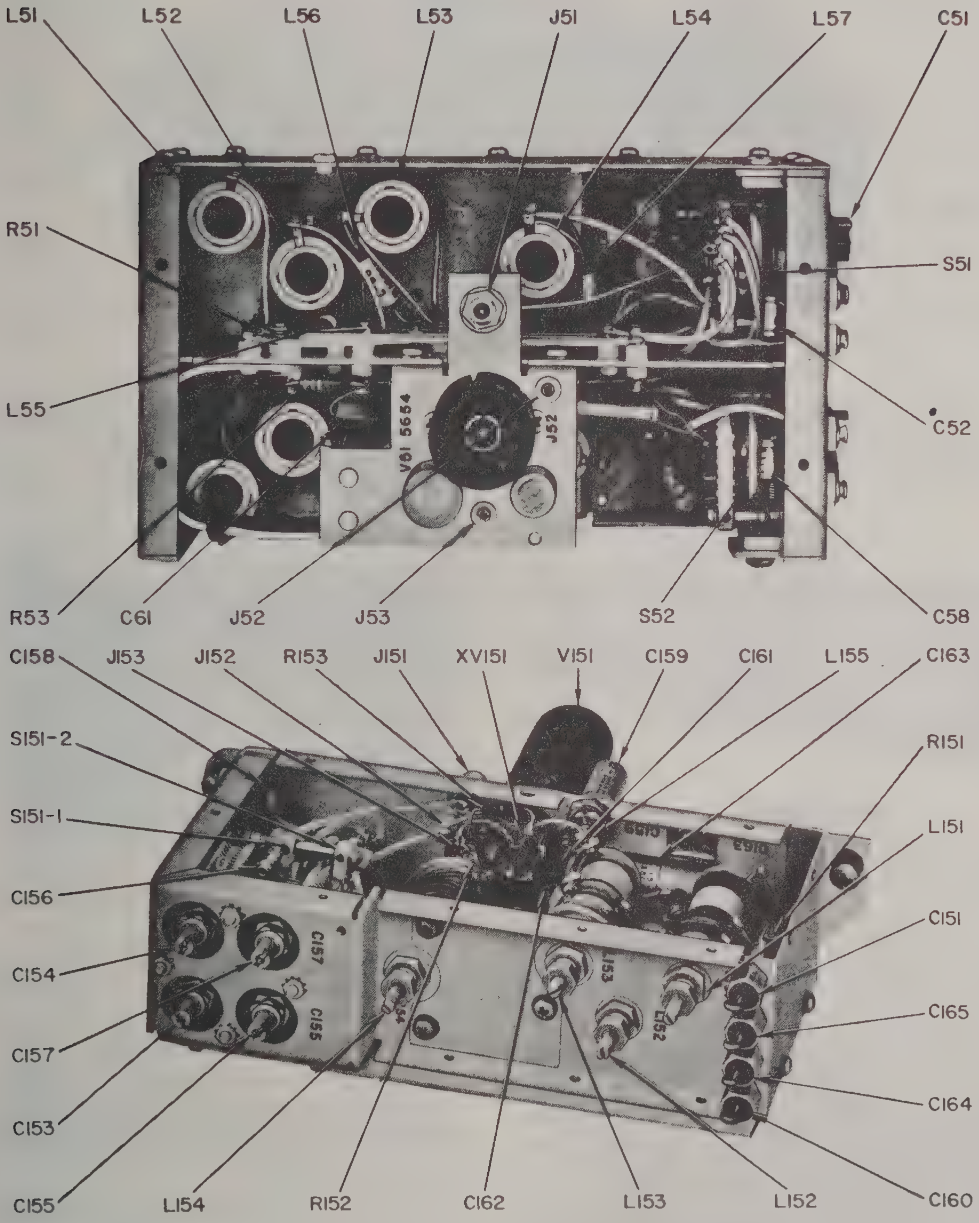

L51
L52
L56
L53
J51
L54
L57
C51
R51
S51
L55
C52
R53
C61
J52
J53
S52
C58
C158
J153
J152
R153
J151
XV151
V151
C159
C161
L155
C163
S151-2
R151
S151-1
L151
C156
C151
C154
C165
C157
C164
C153
C155
L154
R152
C162
L153
L152
C160

Figure 5—12. Preselector, Location of Parts
(Sheet 2 of 3)

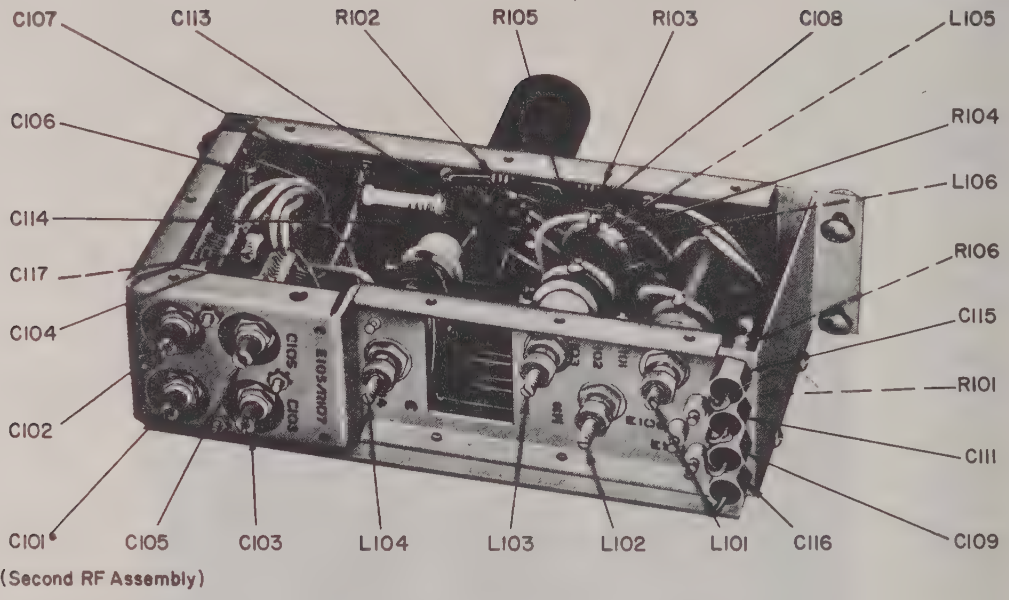


Figure 5-12. Preselector, Location of Parts (Sheet 3 of 3)

(1) Seating of tubes V501 through V508 in their sockets

(2) Cable connections at J501, J507, J508, J509, and J511

(3) All soldered connections at chassis feed-through terminals.

WARNING

Potentials as high as 210 volts rms are present in the power-supply circuits. Avoid contact.

d. TEST EQUIPMENT AND SPECIAL TOOLS.— Use Multimeter AN/PSM-4B, VTVM ME-6D/U, ME-30/U, and two AN/URM-25D Signal Generators, or their equivalents. No special tools are required.

e. CONTROL SETTINGS.— Place the controls in the positions listed in table 5-2. Exceptions will be made in certain steps of the trouble-shooting procedure.

f. INJECTION IF TROUBLE-SHOOTING CHART. — Table 5-8 is the trouble-shooting chart for the injection IF amplifier. Perform the steps in the order shown and compare results with those listed in the NORMAL INDICATION column. If the indication is abnormal, follow the instructions given in the NEXT STEP column. Table 6-6 is the voltage and resistance measurements for the injection IF amplifier.

5-12. 80 KC FILTER.

a. DIAGRAMS.— Figure 5-24 is a functional schematic diagram of the 80 kc filter, and figure 5-25 shows the location of parts and test points. Refer also to figure 5-18 because the plate circuit load for V503, injection IF mixer, is located in the 80 kc filter (FL1301).

b. ACCESS.— The 80 kc filter is located in the lower demodulator deck. For access, extend the demodulator and raise the upper deck.

c. PRELIMINARY CHECK.—Before trouble-shooting the 80 kc filter, check the following:

(1) Input connector J1301

(2) Output connectors J1302 and J1303

(3) The soldered connection at feed-through capacitor C1304.

d. TEST EQUIPMENT AND SPECIAL TOOLS.— Use Multimeter AN/PSM-4B, VTVM ME-30/U, and Signal Generator AN/URM-25D or their equivalents. No special tools are required.

e. CONTROL SETTINGS.— Place the controls in the positions listed in table 5-2. In addition, place the POWER switch in ON position. Allow 30 seconds for warm-up.

f. 80 KC FILTER TROUBLE-SHOOTING.

(1) Connect the multimeter, set at 200 volts, between feed-through capacitor C1304 and the chassis, test point ★40. The normal reading is +170 vdc ±20% tol. If the reading is abnormal, refer to table 5-6, demodulator power supply, and perform as many steps as are necessary to obtain normal reading.

(2) Turn power off and disconnect cables J1301, J1302 and J1303 from filter. Connect the signal generator to J1301 through a 22 k resistor and adjust the generator for an 80 kc, 100 mv output.

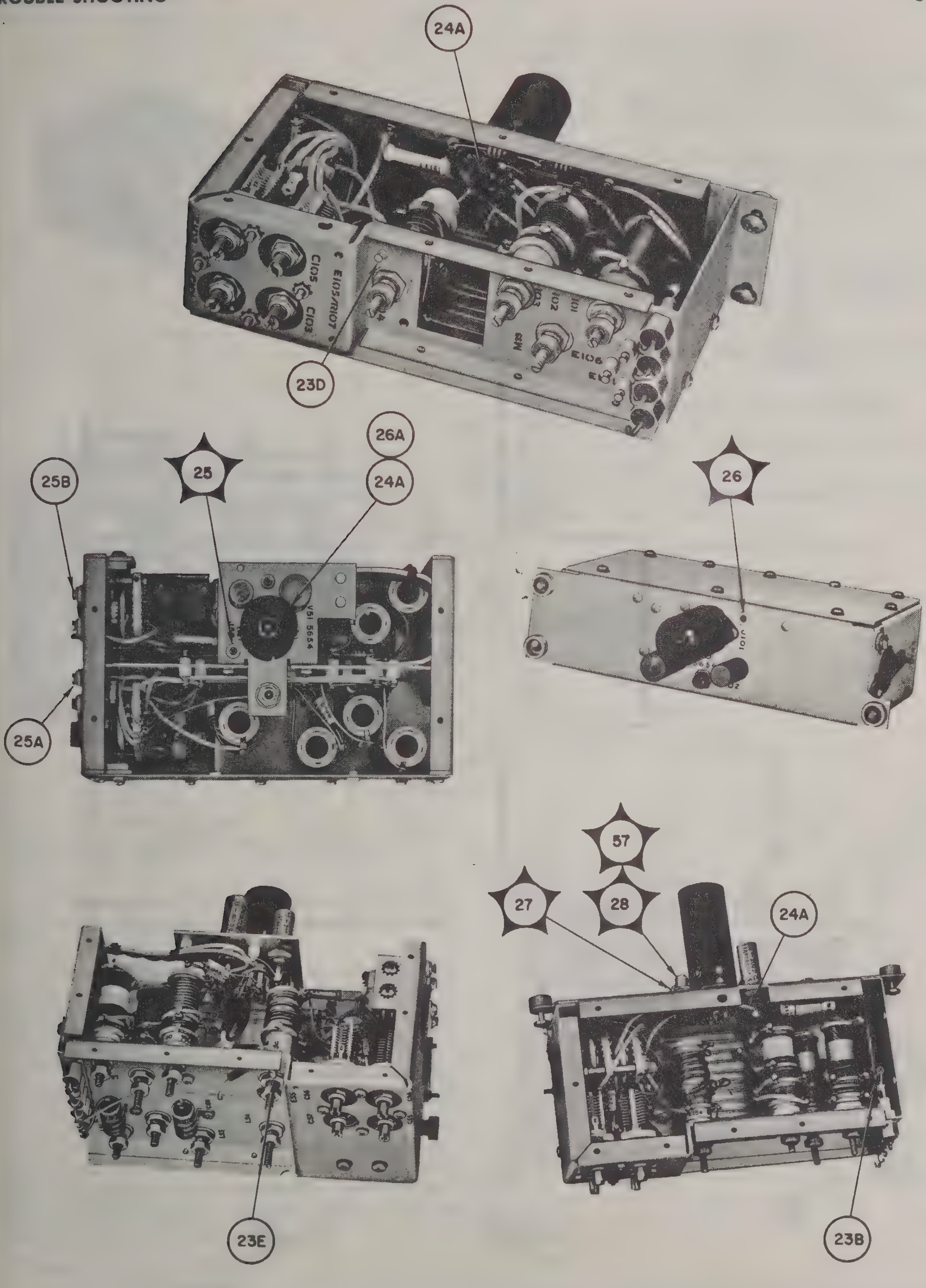

24A
23D
25B
25
26A
24A
26
25A
57
27
28
24A
23E
23B

Figure 5—13. Preselector, Location of Test Points

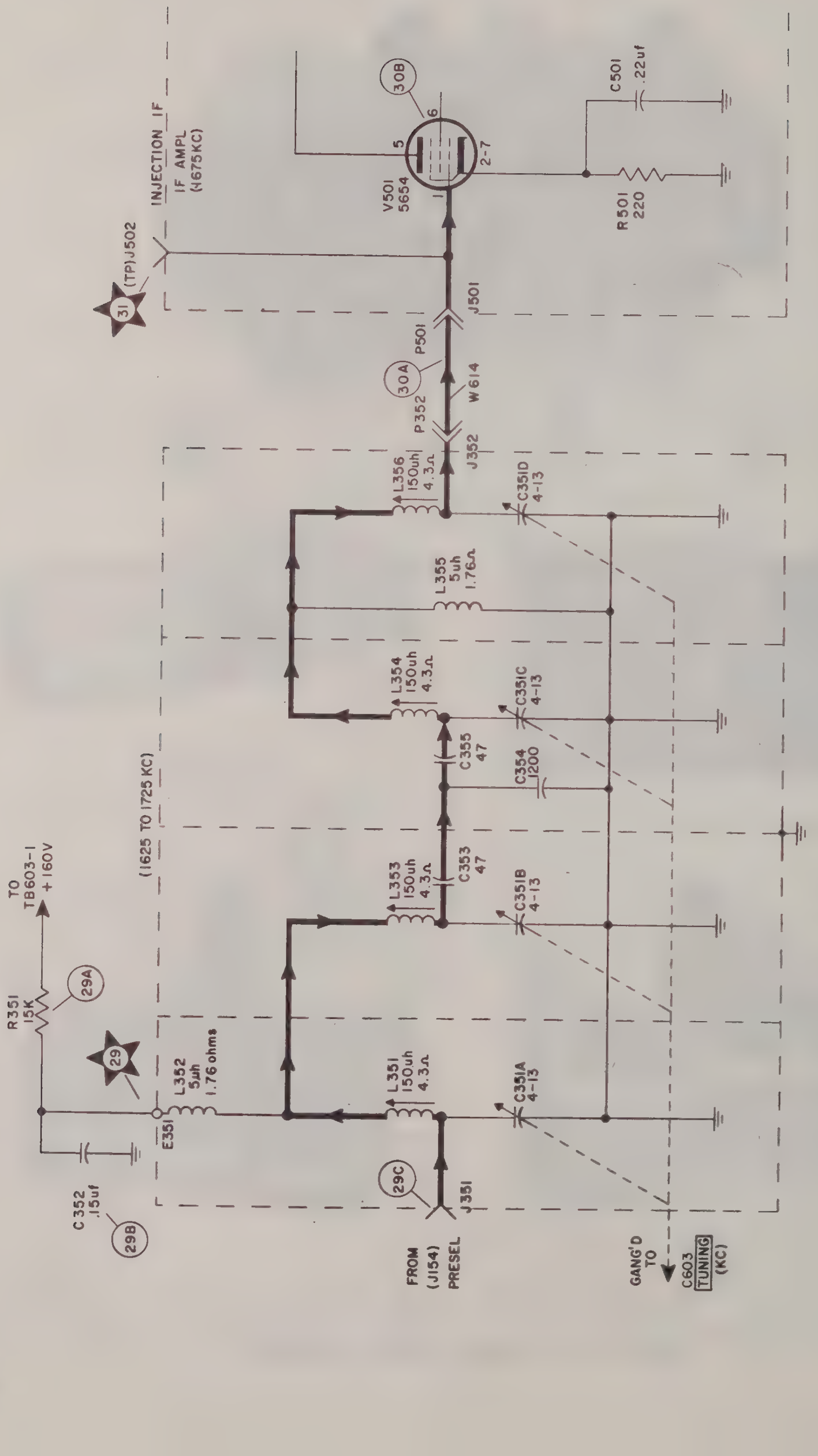

INJECTION IF
IF AMPL
(4675KC)
(TP)J502
31
30B
5
6
2-7
1
V501
5654
C501
.22uf
R501
220
J501
P501
30A
W614
P352
J352
L356
150uh
4.3Ω
C351D
4-13
L355
5uh
1.76Ω
L354
150uh
4.3Ω
C351C
4-13
C355
47
C354
1200
(1625 TO 1725 KC)
TO
TB603-1
+160V
L353
150uh
4.3Ω
C353
47
C351B
4-13
R351
15K
29A
29
L352
5μh
1.76 ohms
L351
150uh
4.3Ω
C351A
4-13
E351
C352
.15uf
29B
29C
J351
FROM
(J154)
PRESEL
GANG'D
TO
C603
TUNING
(KC)

Figure 5–14. Tunable IF Filter, Functional Schematic Diagram

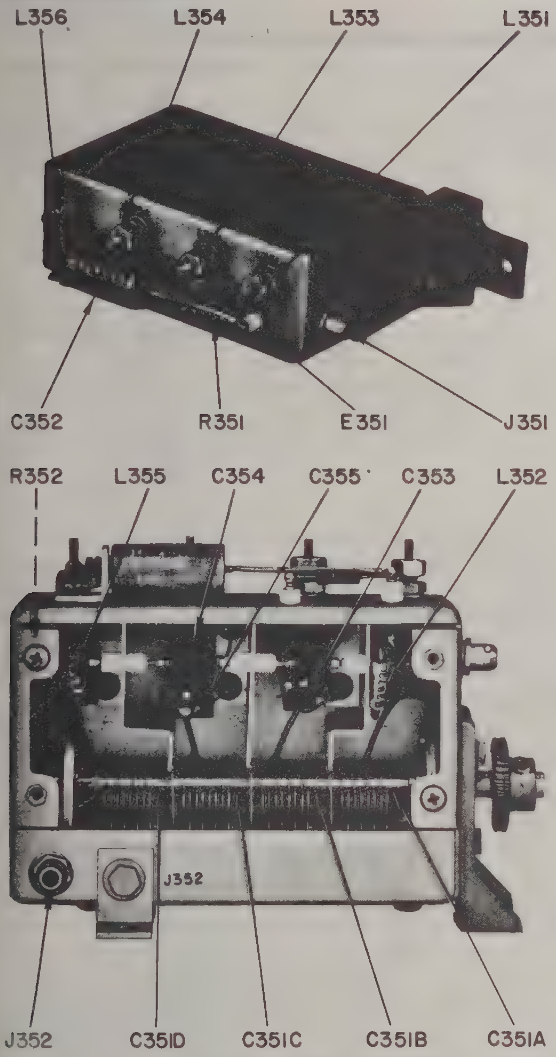


Figure 5-15. Tunable IF Filter, Location of Parts

(3) Connect the VTVM to connector J1302 and J1303 in turn. A normal filter output reading is 50 mv (approx) at each connector.

(4) Check the filter bandpass by adjusting the generator first to 76 kc and then to 84 kc. Filter output should be 50 mv within 1 db over this range. Alignment information for filter FL1301 is given in paragraph 6-4*a*.

5-13. AM DETECTOR-AMPLIFIER.

a. DIAGRAMS.— Figure 5-26 is a functional block diagram showing the relationship among circuit sections of the AM detector-amplifier. For a complete schematic diagram of this subassembly, refer to figure 6-18. Individual functional schematic diagrams of the circuit sections are as follows:

Figure	*Circuit*
5-27	AGC amplifier
5-28	80 kc IF amplifier
5-29	RF bandpass selector
5-30	Detector, automatic noise limiter, audio silencer, and audio amplifier
5-31	Beat-frequency oscillator (BFO)
5-32	Output limiter and audio amplifier

b. ACCESS.— The AM detector-amplifier is located in the upper demodulator deck. Figure 5-33 shows the location of parts and figure 5-34 the location of test points.

c. PRELIMINARY CHECK.— Before trouble-shooting the AM detector-amplifier, make a preliminary inspection with the power off and with emphasis on the following:

(1) Seating of tubes V1601 through V1611 in their sockets

(2) Cable connections at J1601 and TB1601

(3) All soldered connections at chassis feed-through terminals

(4) Normal mechanical function of the following demodulator panel controls:

(*a*) R.F. SELECTIVITY B.W.-KCS.

(*b*) A.M.-A.G.C. TIME CONSTANT

(*c*) B.F.O.

(*d*) A.M./A.F. LEVEL

(*e*) SILENCER

(*f*) O.L. THRES.

(*g*) A.F. LEVEL LINE A.

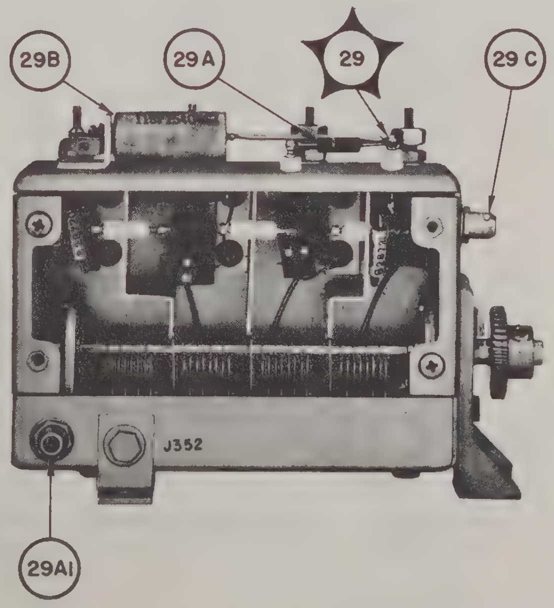


Figure 5-16. Tunable IF Filter, Location of Test Points

TABLE 5-8. INJECTION IF AMPLIFIER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	30 Figs. 5-18 5-19 5-20 5-21 5-22 5-23 Table 6-6	Turn receiver power on. Connect multimeter, on 200 vdc range, between chassis feed-through capacitor C533 and chassis. All voltage tolerances in this table ±20%.	C533: +160 vdc	If there is no reading, perform step 4 in table 5-5. Check C533. WARNING Turn off power before making ohmmeter measurements. If reading is normal or low, proceed to step 2.
2	30A	Connect multimeter to C528 at junction of R509 and R532. Use 200 vdc range.	C528: +150 vdc	If reading is abnormal, check C528, R509, and R532. (See step 1 WARNING note.)
3	31 31A 31B 31C Figs. 5-17 5-18 5-19 5-20 5-21 5-22 5-23 Table 6-6	Remove cables at connectors J501, J509, and J511. Connect a signal generator between J501 and chassis, adjust for a 1675 kc signal (.01 v). Measure 1675 kc signal at test point TP J503 with VTVM, selecting appropriate ranges.	TP J503: .067 v rms	If no signal is present, replace V501. Check socket pin voltages, using table 6-6. If still no signal, check R503 and Z501. Instructions for replacing parts are given in par. 6-5*b*(4).
4	32 32A	Connect a second signal generator to TP J510, adjust for 1455 kc output (.09 v). Measure signal at test point J504 with VTVM.	TP J504: .054 v rms (First generator must be connected to J501, see step 3)	If no signal is present, replace V507. Check the socket pin voltages. Check T503.
5	33 33A	Measure signal at test point J505 with VTVM.	TP J505: v rms (First generator must be connected to J501, see step 3)	If no signal is present, replace V502. Check socket pin voltages. Check FL502.

TABLE 5-8. INJECTION IF AMPLIFIER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
6	34	Remove signal generator from TP J510 and connect it to J511. Set for 140 kc output (.05 v). Measure 140 kc signal at TP J506 with VTVM.	TP J506: .85 v rms	If there is no signal, perform step 7.
7	33 38 34A	Remove signal generator from J501 and connect it to TP J505, adjust for a 220 kc .04 v signal. Short pins 5 and 6 of V503.	J507: .08 v rms (Pins 5 and 6 V503 shorted)	If no signal is present, check V503 and V508. Check socket pin voltages using table 6-6. Disconnect both signal generators, remove short at V503.

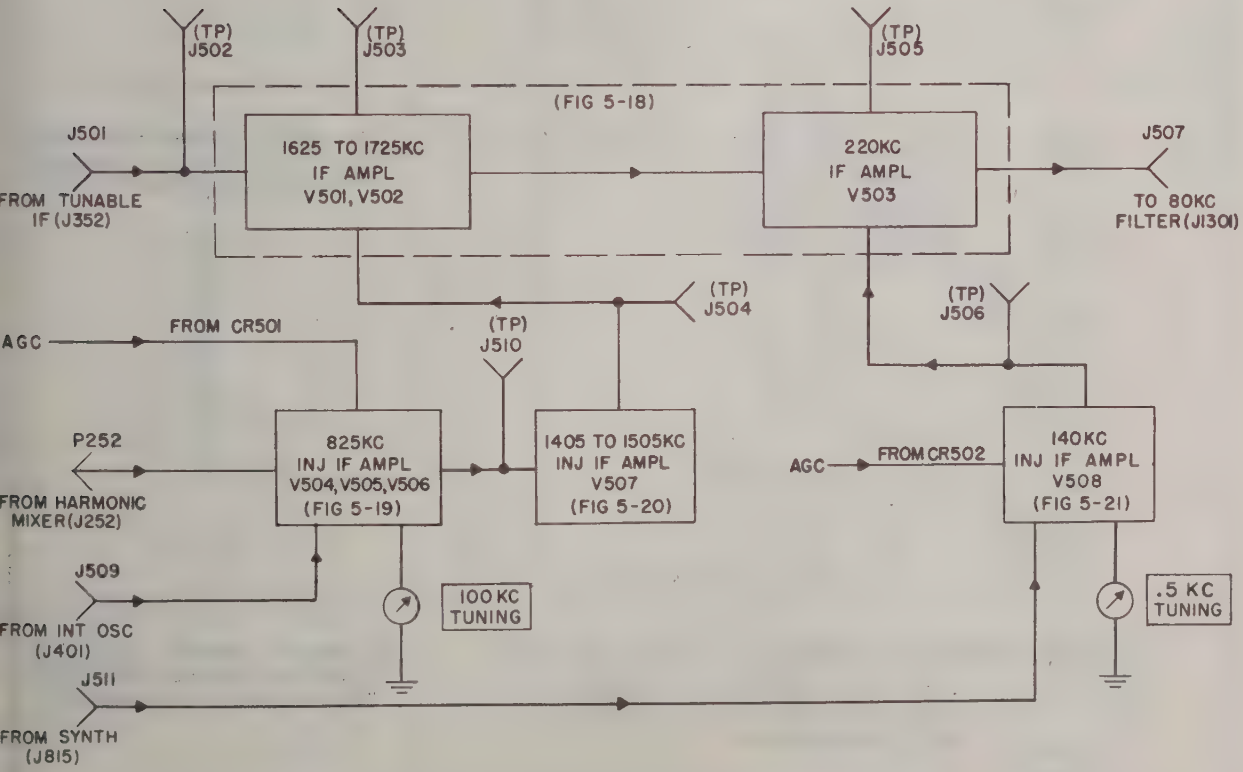

(TP) J502
(TP) J503
(TP) J505
(FIG 5-18)
J501
FROM TUNABLE IF (J352)
1625 TO 1725KC IF AMPL V501, V502
220KC IF AMPL V503
J507
TO 80KC FILTER (J1301)
(TP) J504
(TP) J506
AGC
FROM CR501
(TP) J510
P252
FROM HARMONIC MIXER (J252)
825KC INJ IF AMPL V504, V505, V506 (FIG 5-19)
1405 TO 1505KC INJ IF AMPL V507 (FIG 5-20)
AGC
FROM CR502
140KC INJ IF AMPL V508 (FIG 5-21)
J509
FROM INT OSC (J401)
100 KC TUNING
.5 KC TUNING
J511
FROM SYNTH (J815)

Figure 5-17. Injection IF Amplifier, Functional Block Diagram

TABLE 5-8. INJECTION IF AMPLIFIER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
8	35 35A Figs. 5-17 5-18 5-19 5-20 5-21 5-22 5-23	Connect a signal generator to P252, adjust for an 825 kc output signal (.015 v). Measure signal at terminal G of FL504.	Terminal G of FL504: .001 v rms	If no signal is present, replace V504. Check socket pin voltages using table 6-6. Check T501 and FL504.
9	37B 35A Fig. 5-19 Table 6-6	Measure signal at pin 7 of V506 with VTVM. (Input signal the same as in step 8.)	Pin 7 of V506: .16 v rms	If no signal is present, check V505. Check both socket pin voltages using table 6-6. Check T501, FL504, and T502.
10	36 37 37A 37B Fig. 5-19 Table 6-6	Connect a second signal generator to J509, adjust for a 630 kc output (0.1 v). Measure signal at test point J510 with VTVM. (First generator adjusted as in step 8.)	TP J510: .09 v rms	If no signal is present, replace V506 with new tube, check socket pin voltages using table 6-6, check FL505.
11	35B 35B1	Check AGC voltage at pin 1 of V505. Connect VTVM to pin 1 of V505. (Input signals from the generators the same as in step 10.)	Pin 1 V505: —6 vdc	If voltage is abnormal, check AGC diode CR501 and parts R516, R519, R522, R525, C523, C519, and C513.

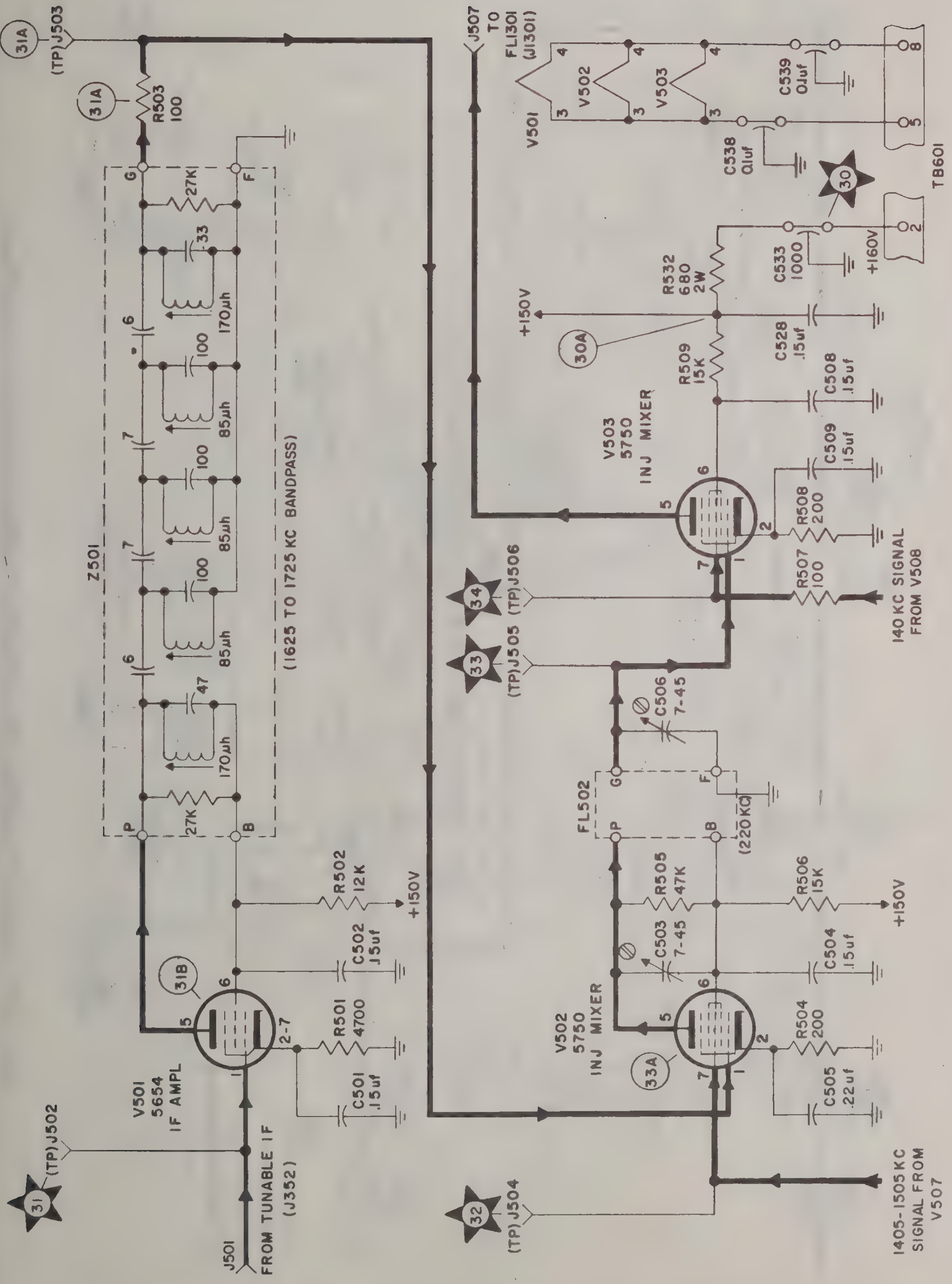
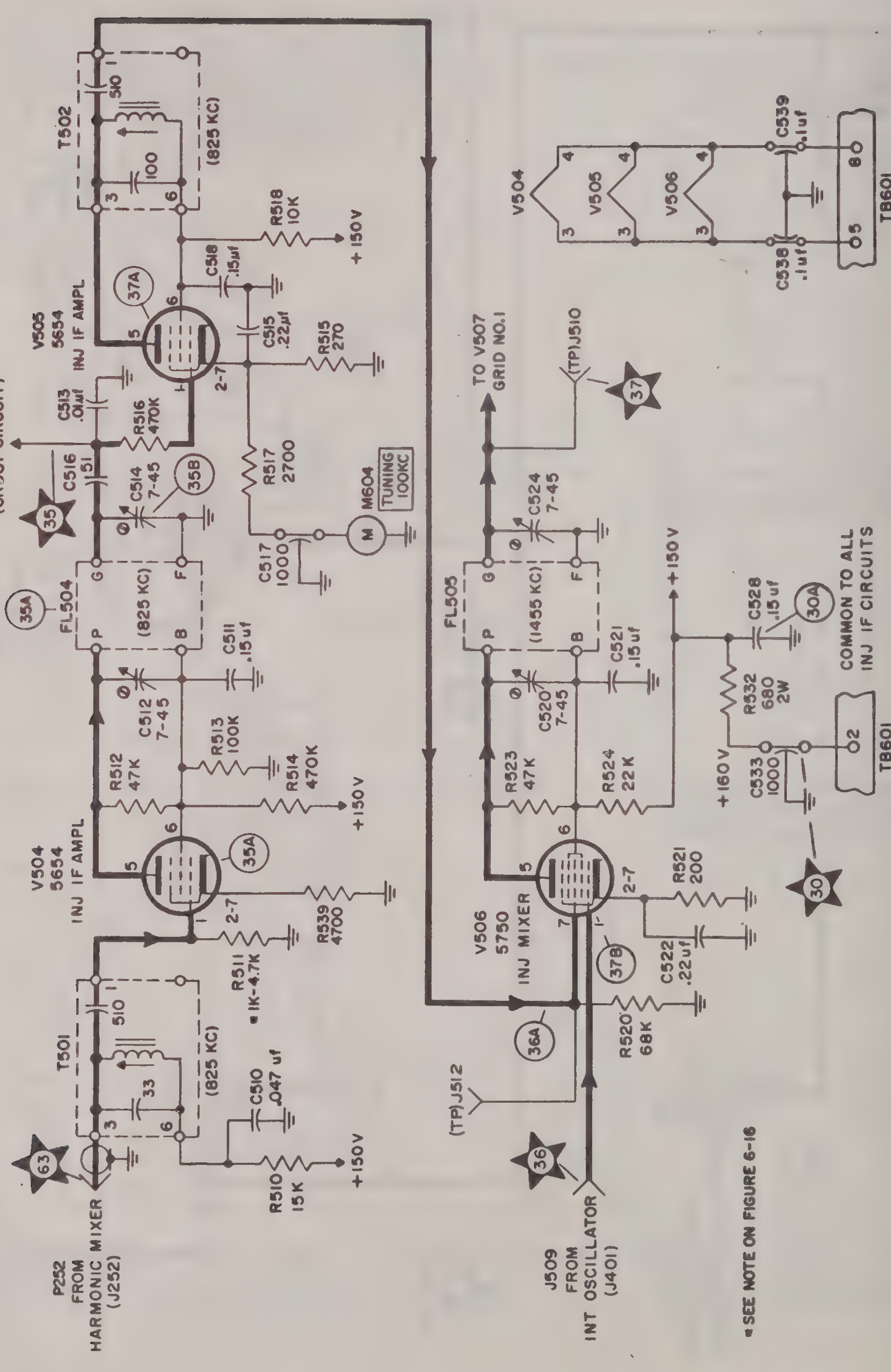

31A
(TP)J503
31A
R503
100
G
F
27K
33
6
170μh
100
85μh
7
100
85μh
7
100
85μh
6
47
170μh
27K
P
B
Z501
(1625 TO 1725 KC BANDPASS)
R502
12K
+150V
C502
.15uf
31B
6
5
V501
5654
IF AMPL
2-7
1
R501
4700
C501
.15uf
31
(TP)J502
J501
FROM TUNABLE IF
(J352)
J507
TO
FL1301
(J1301)
V501
V502
V503
3
4
C539
.01uf
C538
.01uf
8
5
TB601
30
2
C533
1000
+160V
R532
680
2W
+150V
30A
C528
.15uf
R509
15K
C508
.15uf
V503
5750
INJ MIXER
C509
.15uf
R508
200
R507
100
140 KC SIGNAL
FROM V508
34
(TP)J506
33
(TP)J505
C506
7-45
FL502
G
F
P
B
(220 KC)
R505
47K
R506
15K
+150V
C503
7-45
C504
.15uf
V502
5750
INJ MIXER
33A
R504
200
C505
.22uf
32
(TP)J504
1405-1505 KC
SIGNAL FROM
V507

Figure 5–18. Injection IF Amplifier, 1625 Kc to 1725 Kc and 220 Kc IF Amplifiers, Functional Schematic Diagram

)


P252
FROM
HARMONIC MIXER
(J252)
63
T501
510
33
(825 KC)
3
6
1
C510
.047 uf
R510
15K
+150V
R511
* 1K-4.7K
V504
5654
INJ IF AMPL
5
6
1
2-7
35A
R539
4700
R512
47K
R513
100K
R514
470K
+150V
C512
7-45
C511
.15uf
FL504
P
B
G
F
(825 KC)
35A
35
C514
7-45
35B
C516
51
AGC
(CR501 CIRCUIT)
C513
.01uf
R516
470K
R517
2700
C517
1000
M
M604
TUNING
100KC
V505
5654
INJ IF AMPL
37A
2-7
C515
.22uf
R515
270
C518
.15uf
R518
10K
+150V
T502
100
510
(825 KC)
J509
FROM
INT OSCILLATOR
(J401)
36
(TP)J512
36A
R520
68K
37B
V506
5750
INJ MIXER
7
C522
.22uf
R521
200
R523
47K
R524
22K
C520
7-45
C521
.15uf
FL505
(1455 KC)
+150V
+160V
C533
1000
R532
680
2W
C528
.15uf
30A
30
COMMON TO ALL
INJ IF CIRCUITS
TB601
2
C524
7-45
TO V507
GRID NO.1
(TP)J510
37
V504
V505
V506
4
3
C538
.1uf
C539
.1uf
TB601
5
8

* SEE NOTE ON FIGURE 6-16

Figure 5–19. Injection IF Amplifier, 825 Kc Injection Amplifier, Functional Schematic Diagram

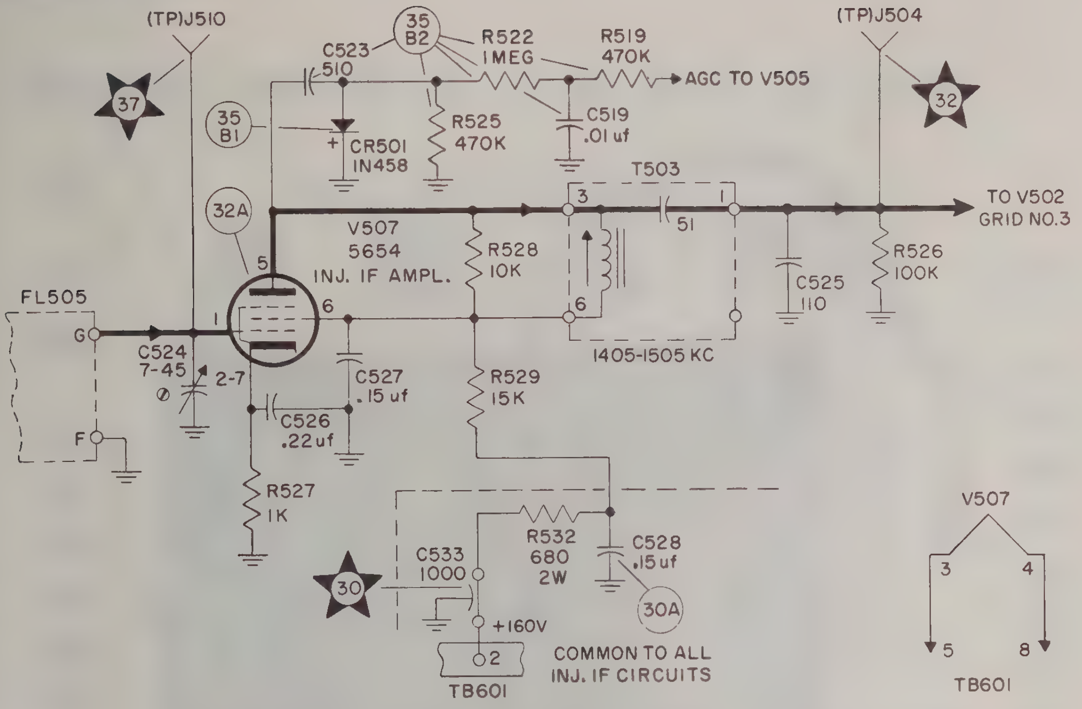

(TP)J510
37
C523
510
35
B2
R522
1MEG
R519
470K
AGC TO V505
(TP)J504
32
35
B1
CR501
IN458
R525
470K
C519
.01 uf
T503
32A
3
1
51
TO V502
GRID NO.3
V507
5654
INJ. IF AMPL.
R528
10K
R526
100K
C525
110
FL505
G
5
6
1
6
C524
7-45
2-7
C527
.15 uf
1405-1505 KC
R529
15K
C526
.22 uf
F
R527
1K
R532
680
2W
C528
.15 uf
C533
1000
30
30A
+160V
2
TB601
COMMON TO ALL
INJ. IF CIRCUITS
V507
3
4
5
8
TB601

Figure 5-20. Injection IF Amplifier, 1405 Kc to 1505 Kc Injection Amplifier, Functional Schematic Diagram

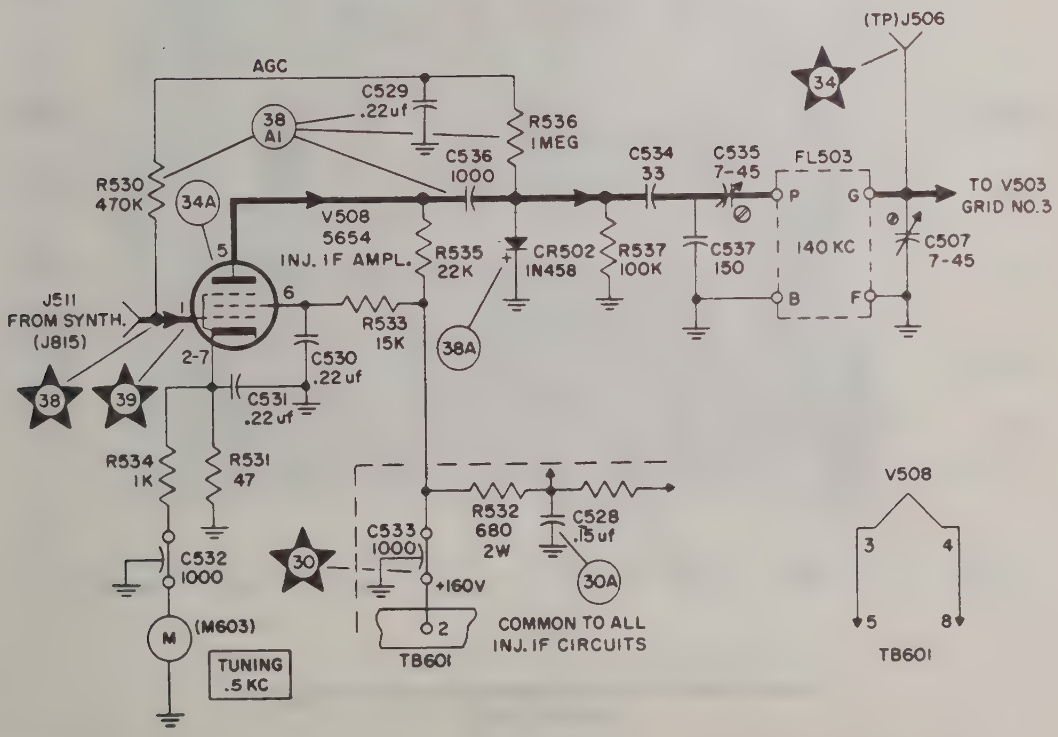

(TP)J506
34
AGC
C529
.22 uf
38
A1
R536
1MEG
C536
1000
C534
33
C535
7-45
FL503
R530
470K
34A
V508
5654
INJ. IF AMPL.
P
G
TO V503
GRID NO.3
5
R535
22K
CR502
IN458
R537
100K
C537
150
140 KC
C507
7-45
J511
FROM SYNTH.
(J815)
1
6
R533
15K
38A
B
F
2-7
C530
.22 uf
38
39
C531
.22 uf
R534
1K
R531
47
R532
680
2W
C528
.15 uf
C533
1000
30
30A
+160V
C532
1000
M
(M603)
2
TB601
TUNING
.5 KC
COMMON TO ALL
INJ. IF CIRCUITS
V508
3
4
5
8
TB601

Figure 5-21. Injection IF Amplifier, 140 Kc Injection Amplifier, Functional Schematic Diagram

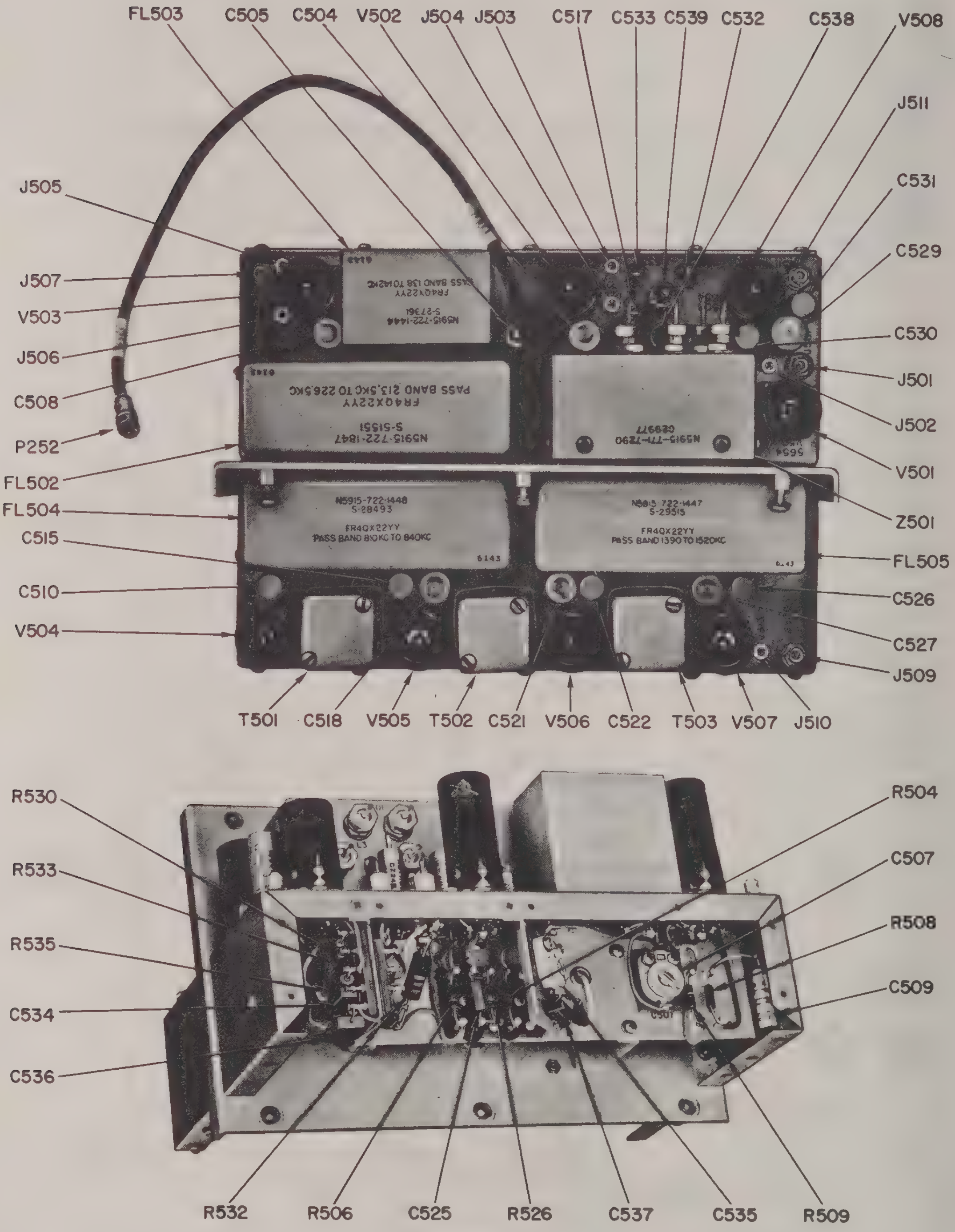

FL503
C505
C504
V502
J504
J503
C517
C533
C539
C532
C538
V508
J511
C531
C529
C530
J501
J502
V501
Z501
FL505
C526
C527
J509
J505
J507
V503
J506
C508
P252
FL502
FL504
C515
C510
V504
T501
C518
V505
T502
C521
V506
C522
T503
V507
J510
N5915-722-1448
S-28493
FR4QX22YY
PASS BAND 810KC TO 840KC
N5915-722-1447
S-29515
FR4QX22YY
PASS BAND 1390 TO 1520KC
R530
R533
R535
C534
C536
R504
C507
R508
C509
R532
R506
C525
R526
C537
C535
R509

Figure 5–22. Injection Amplifier, Location of Parts
(Sheet 1 of 2)

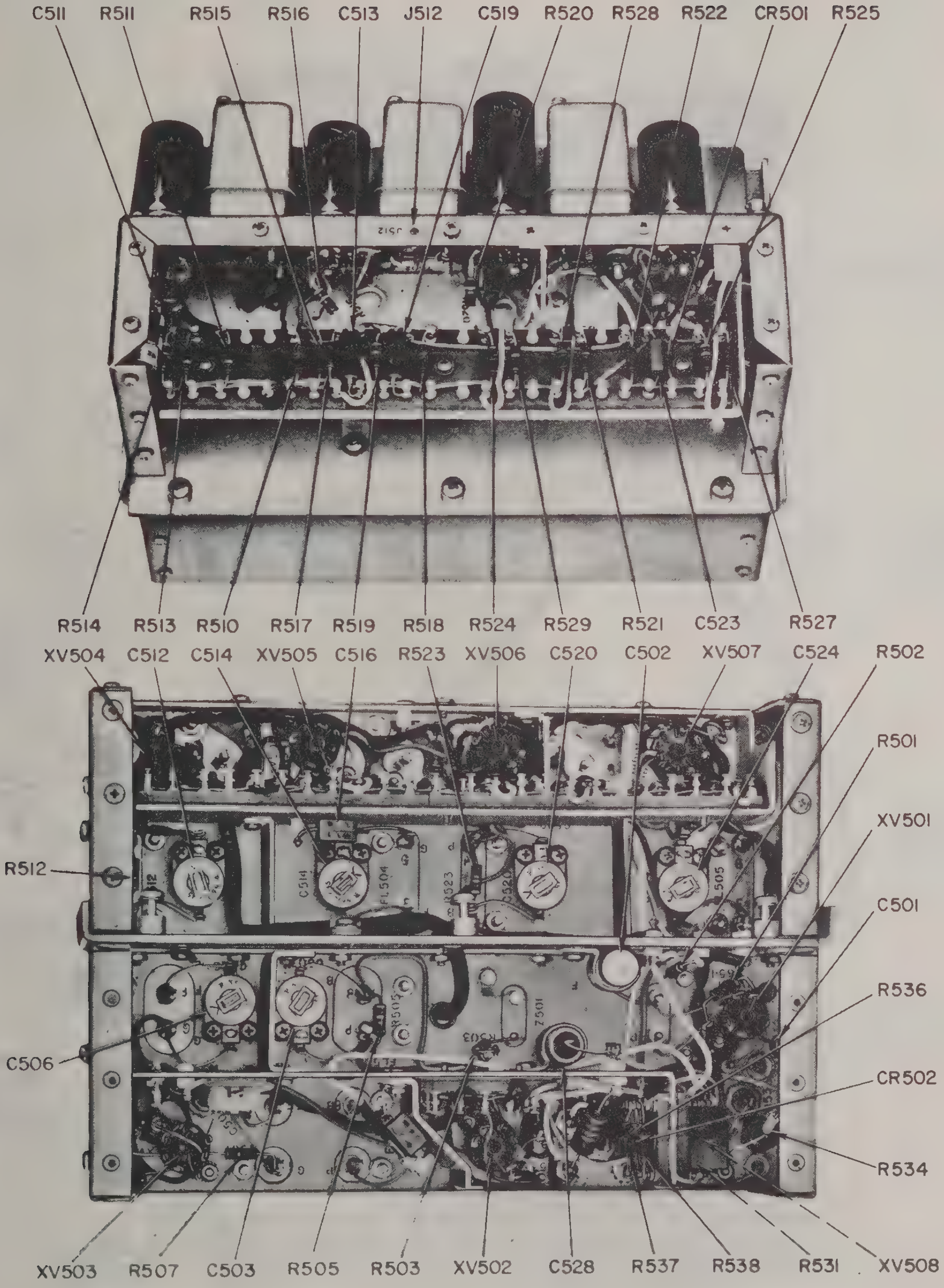

C511
R511
R515
R516
C513
J512
C519
R520
R528
R522
CR501
R525
R514
R513
R510
R517
R519
R518
R524
R529
R521
C523
R527
XV504
C512
C514
XV505
C516
R523
XV506
C520
C502
XV507
C524
R502
R501
XV501
C501
R536
CR502
R534
R512
C506
XV503
R507
C503
R505
R503
XV502
C528
R537
R538
R531
XV508

Figure 5—22. Injection Amplifier, Location of Parts
(Sheet 2 of 2)

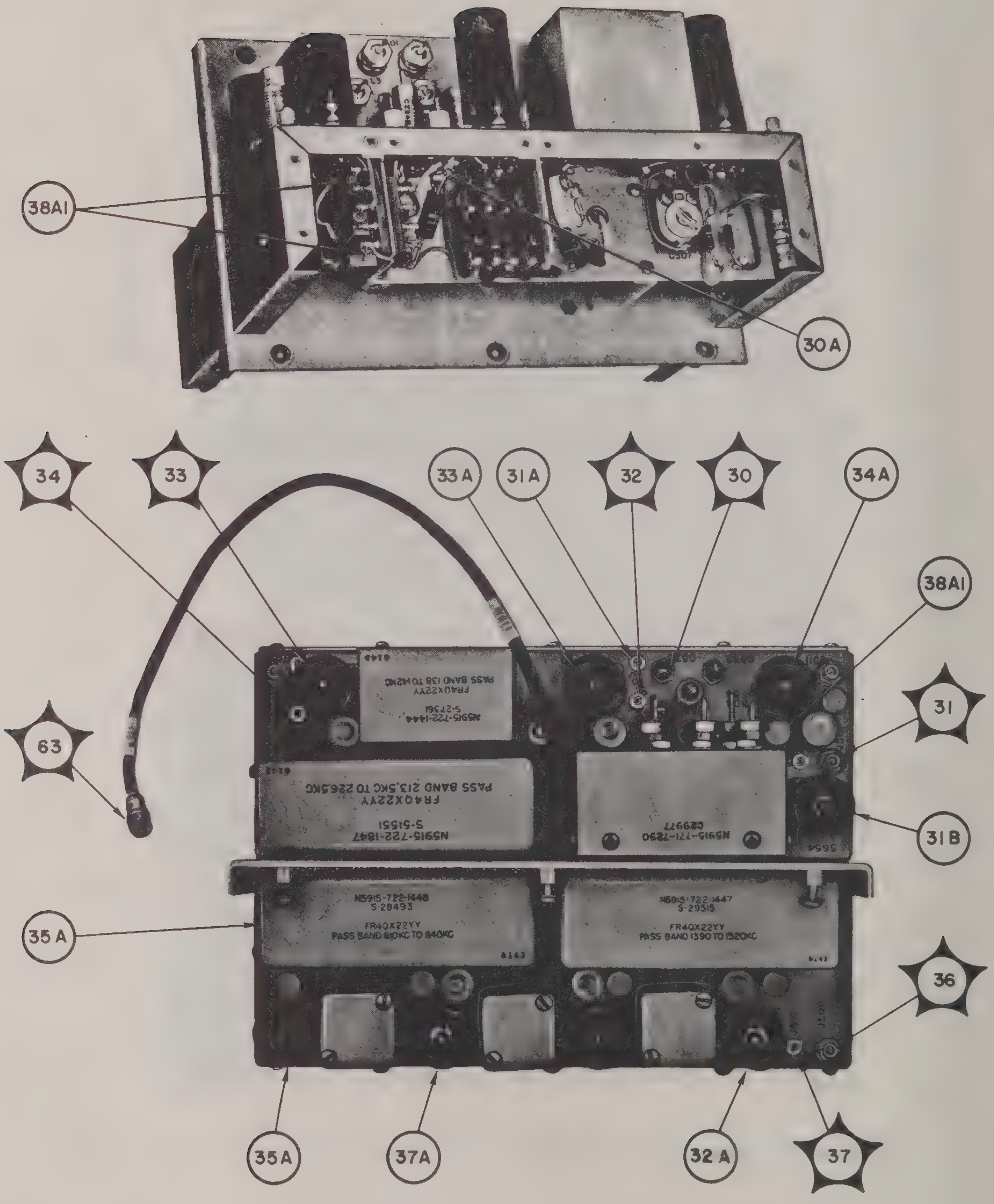

38A1
30 A
34
33
33 A
31 A
32
30
34 A
38A1
31
63
31 B
N5915-722-1448
S-28493
FR4QX22YY
PASS BAND 810KC TO 840KC
N5915-722-1447
S-29515
FR4QX22YY
PASS BAND 1390 TO 1520KC
35 A
36
35A
37A
32 A
37

Figure 5—23. Injection IF Amplifier, Location of Test Points
(Sheet 1 of 2)

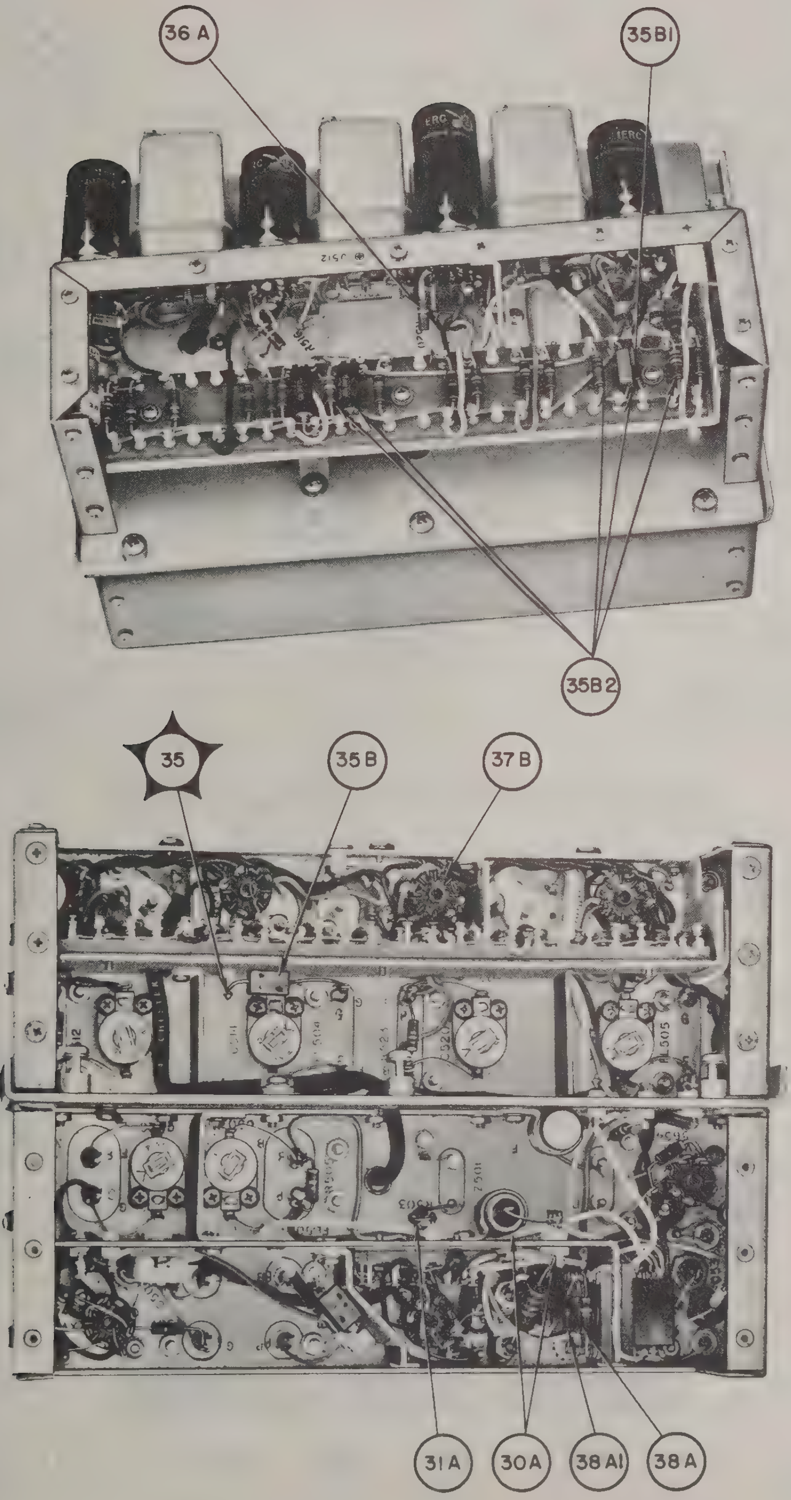

36 A
35B1
35B2
35
35 B
37 B
31A
30A
38A1
38A

Figure 5—23. Injection IF Amplifier, Location of Test Points (Sheet 2 of 2)

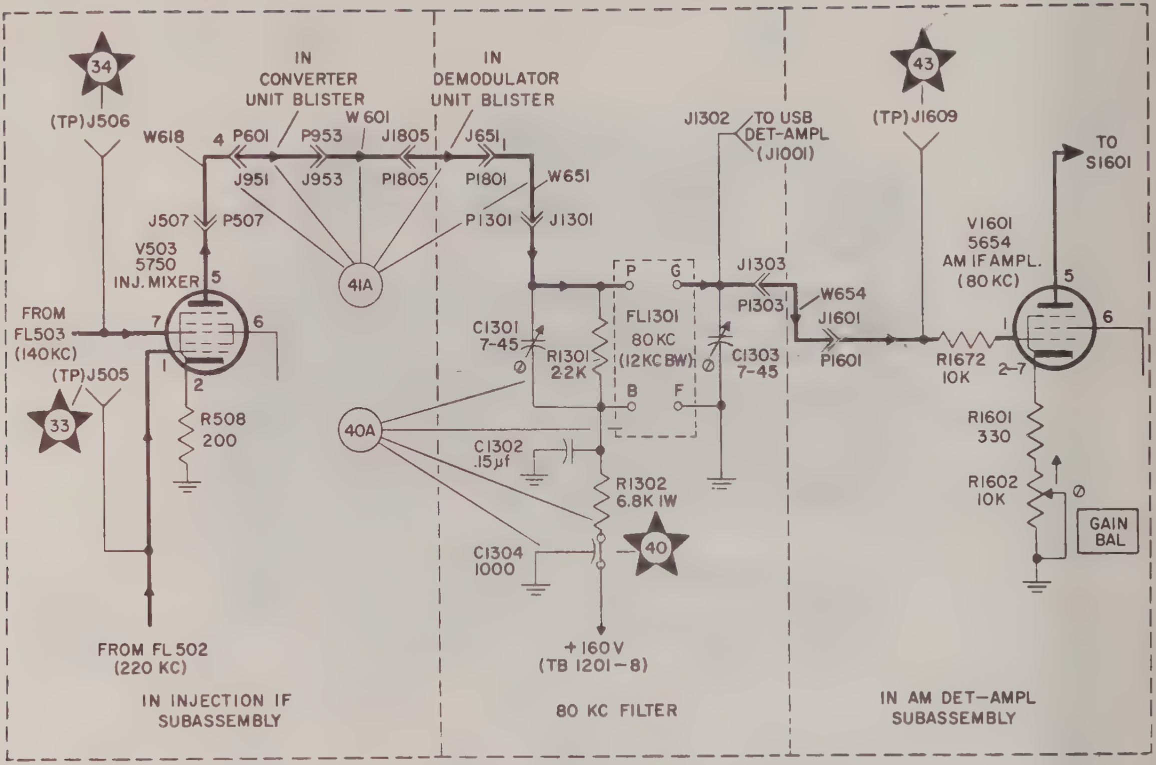

34
(TP)J506
IN CONVERTER UNIT BLISTER
IN DEMODULATOR UNIT BLISTER
W618
4
P601
P953
W 601
J1805
J651
1
J951
J953
P1805
P1801
W651
J507
P507
P1301
J1301
V503
5750
INJ. MIXER
5
41A
FROM
FL503
(140KC)
7
6
1
2
(TP)J505
33
R508
200
FROM FL 502
(220 KC)
IN INJECTION IF SUBASSEMBLY
J1302
TO USB DET-AMPL (J1001)
J1303
P1303
W654
J1601
P1601
P
G
FL1301
80 KC
(12KC BW)
B
F
C1301
7-45
R1301
2.2K
C1303
7-45
40A
C1302
.15μf
R1302
6.8K 1W
C1304
1000
40
+160V
(TB 1201-8)
80 KC FILTER
43
(TP)J1609
TO
S1601
V1601
5654
AM IF AMPL.
(80 KC)
5
6
1
2-7
R1672
10K
R1601
330
R1602
10K
GAIN
BAL
IN AM DET-AMPL SUBASSEMBLY

Figure 5-24. 80 Kc Filter, Functional Schematic Diagram

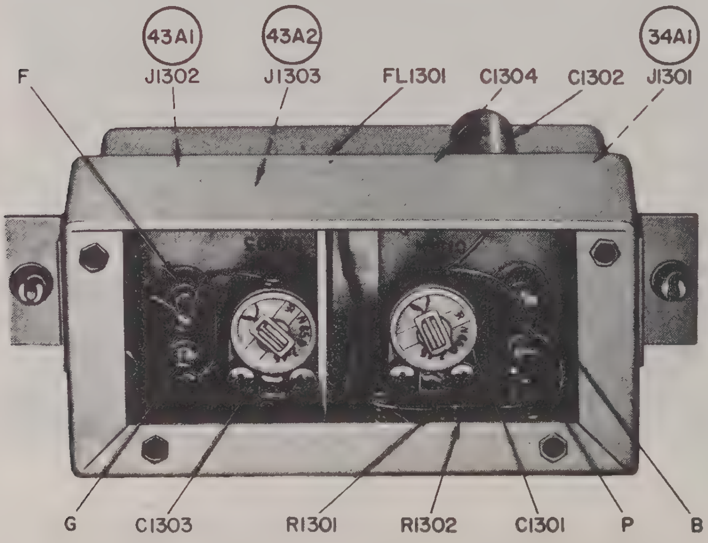

43A1
43A2
34A1
F
J1302
J1303
FL1301
C1304
C1302
J1301
G
C1303
R1301
R1302
C1301
P
B

Figure 5-25. 80 Kc Filter, Location of Parts and Test Points

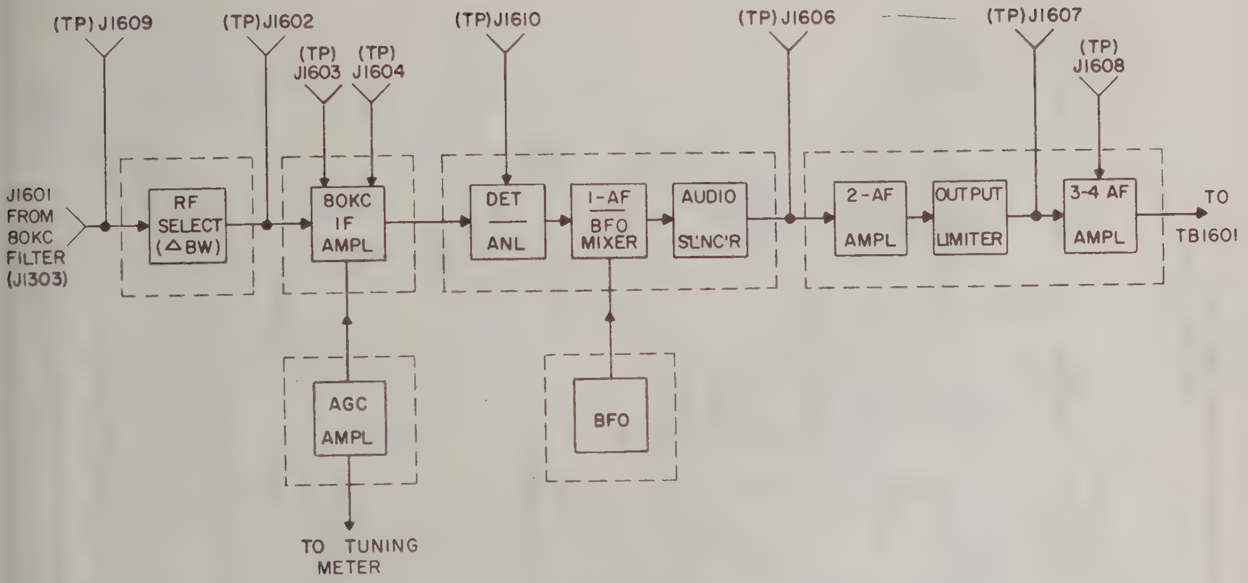

(TP) J1609
(TP) J1602
(TP) J1603
(TP) J1604
(TP) J1610
(TP) J1606
(TP) J1607
(TP) J1608
J1601 FROM 80KC FILTER (J1303)
RF SELECT (△BW)
80KC IF AMPL
DET
ANL
1-AF BFO MIXER
AUDIO SL'NC'R
2-AF AMPL
OUTPUT LIMITER
3-4 AF AMPL
TO TB1601
AGC AMPL
BFO
TO TUNING METER

Figure 5-26. AM Detector-Amplifier, Functional Block Diagram

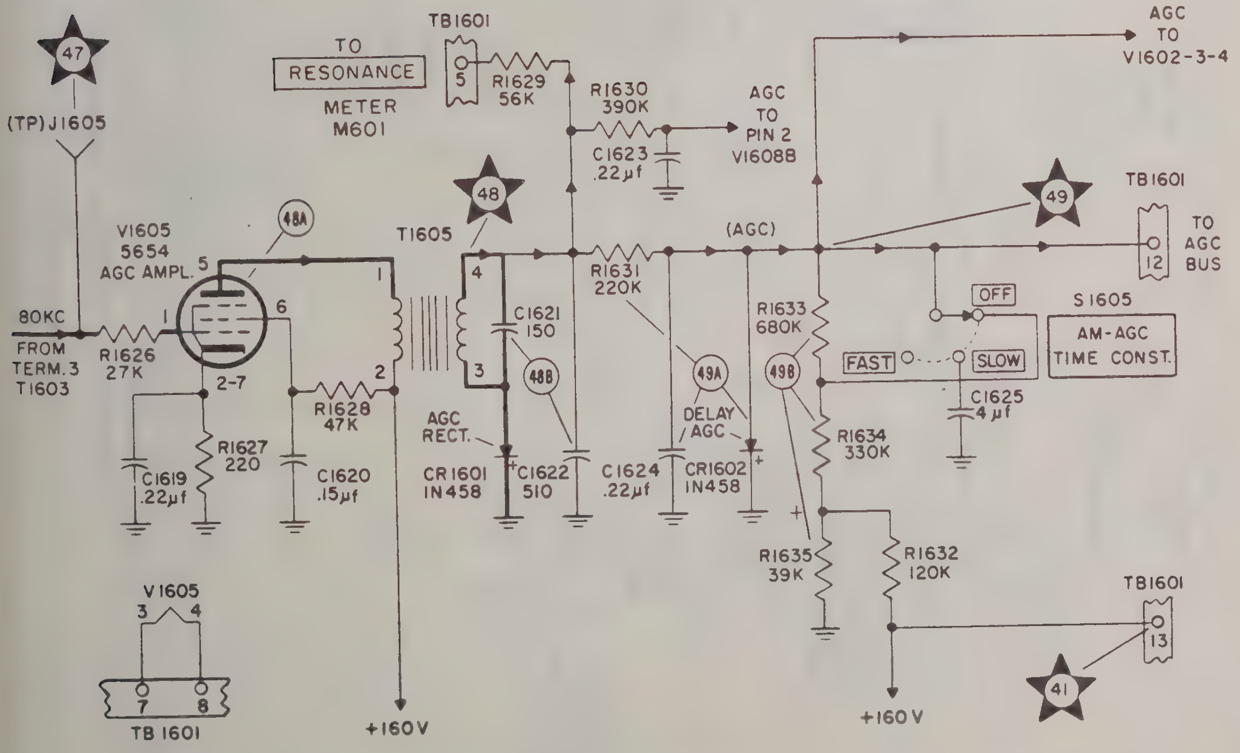

47
(TP) J1605
TO
RESONANCE
METER
M601
TB1601
5
R1629 56K
R1630 390K
AGC TO PIN 2 V1608B
C1623 .22µf
AGC TO V1602-3-4
48
48A
V1605 5654 AGC AMPL.
5
1
6
2-7
80KC FROM TERM.3 T1603
R1626 27K
T1605
1
2
4
3
C1621 150
48B
R1631 220K
(AGC)
49
49A
49B
TB1601
12
TO AGC BUS
OFF
S1605
AM-AGC TIME CONST.
FAST
SLOW
C1625 4µf
R1633 680K
R1634 330K
DELAY AGC
R1628 47K
R1627 220
C1619 .22µf
C1620 .15µf
AGC RECT.
CR1601 IN458
C1622 510
C1624 .22µf
CR1602 IN458
R1635 39K
R1632 120K
TB1601
13
41
V1605
3
4
7
8
TB 1601
+160V
+160 V

Figure 5-27. AM Detector-Amplifier, AGC Amplifier, Functional Schematic Diagram

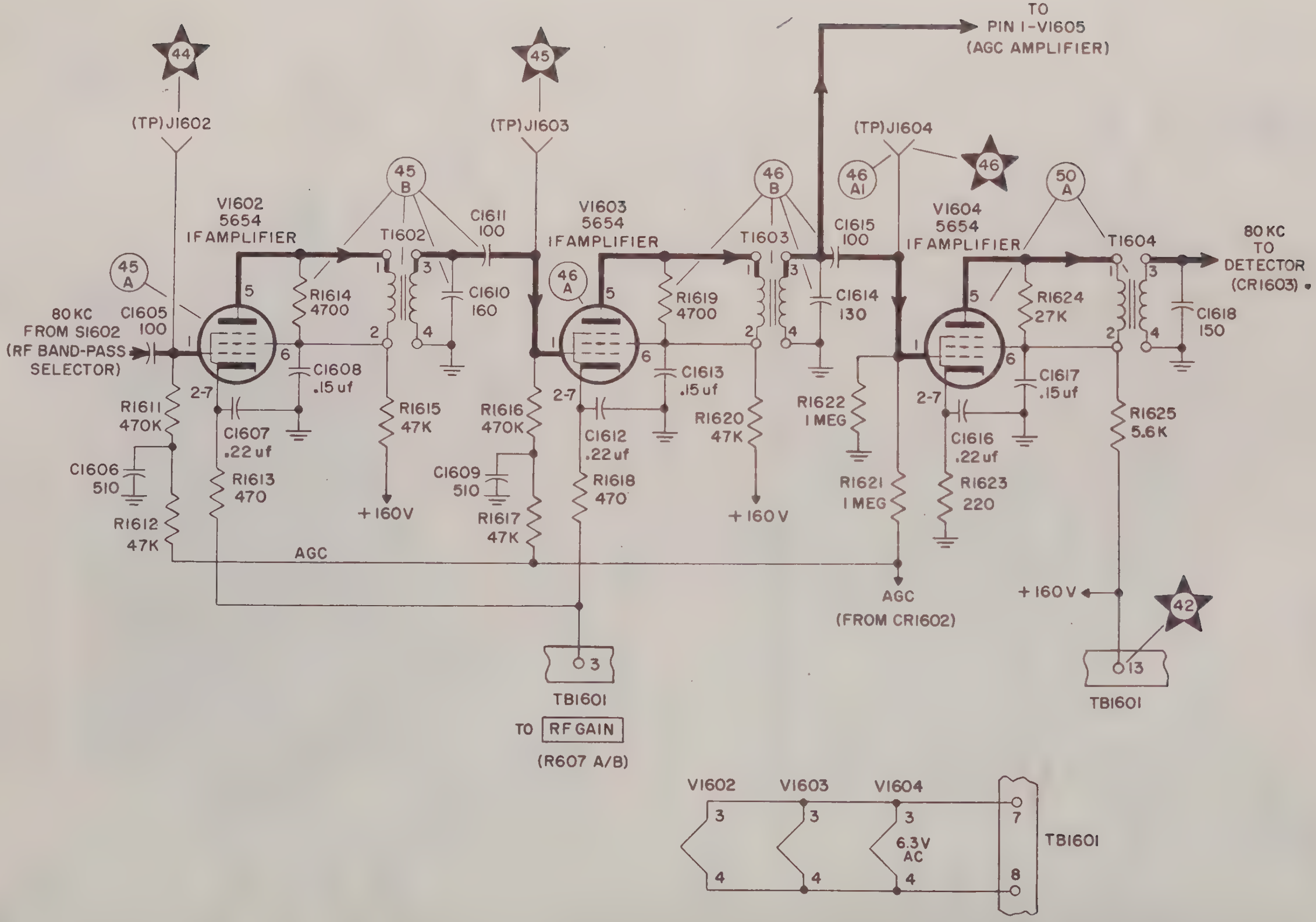
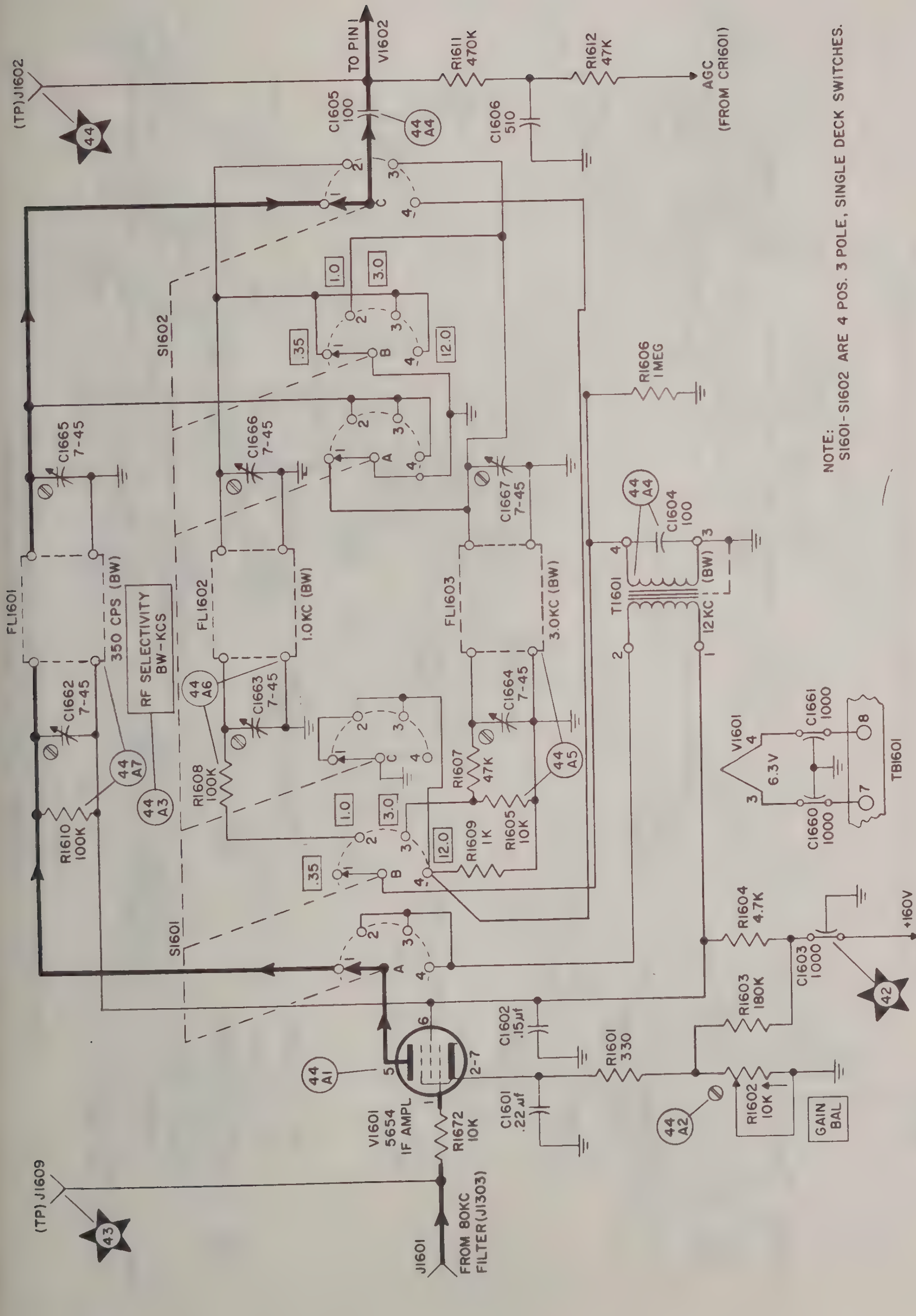
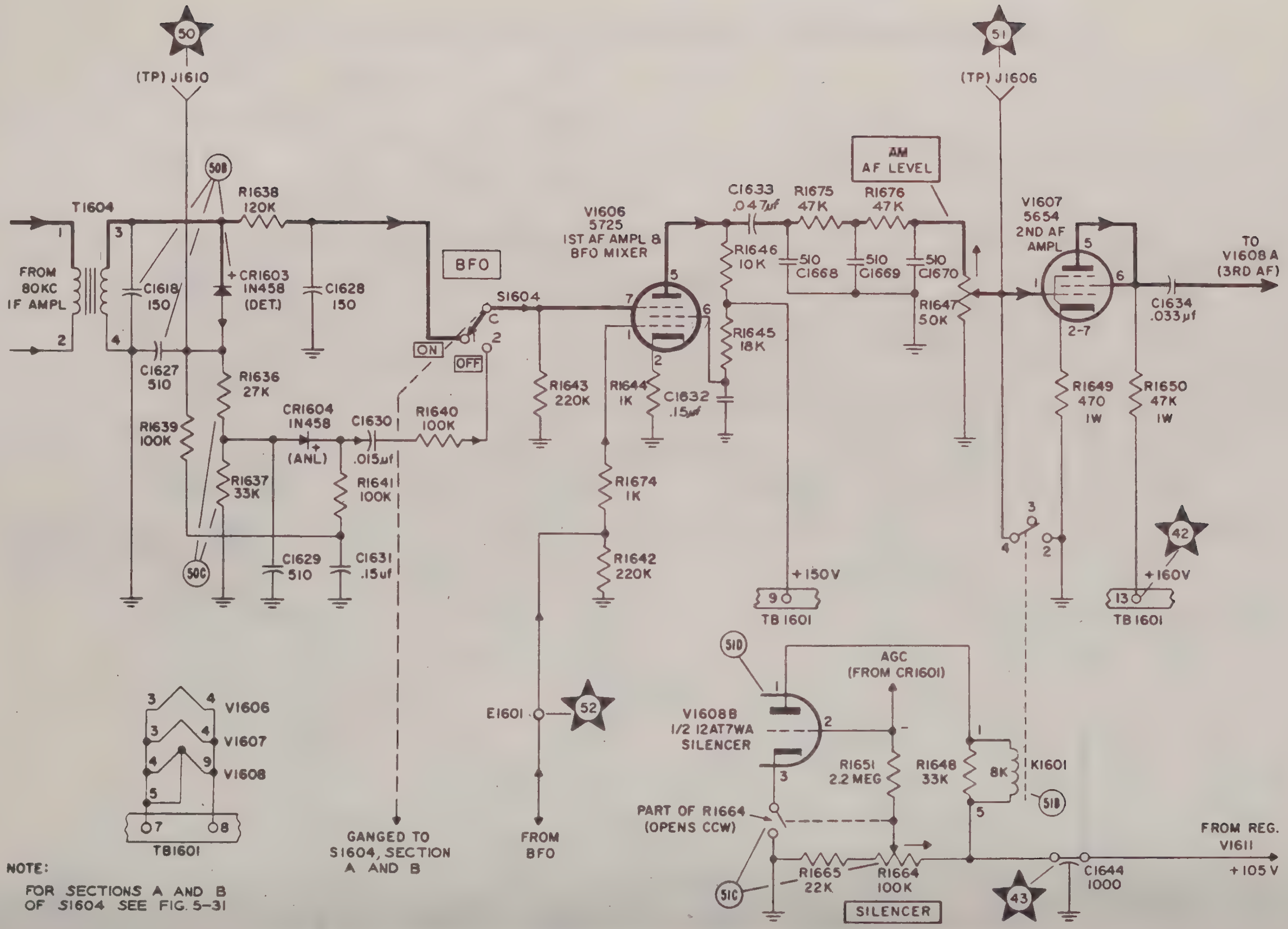

44
(TP)J1602
45
(TP)J1603
TO
PIN 1-V1605
(AGC AMPLIFIER)
(TP)J1604
46
45 A
45 B
46 A
46 B
46 A1
50 A
80 KC
FROM S1602
(RF BAND-PASS
SELECTOR)
C1605
100
V1602
5654
IF AMPLIFIER
R1614
4700
T1602
C1611
100
C1610
160
C1608
.15 uf
R1611
470K
C1607
.22 uf
R1615
47K
C1606
510
R1613
470
+160V
R1612
47K
AGC
V1603
5654
IF AMPLIFIER
R1619
4700
T1603
C1613
.15 uf
R1616
470K
C1612
.22 uf
R1620
47K
C1609
510
R1618
470
R1617
47K
+160 V
C1615
100
C1614
130
R1622
1 MEG
R1621
1 MEG
AGC
(FROM CR1602)
V1604
5654
IF AMPLIFIER
R1624
27K
T1604
C1617
.15 uf
C1616
.22 uf
R1623
220
R1625
5.6 K
80 KC
TO
DETECTOR
(CR1603)
C1618
150
+160 V
42
13
TB1601
3
TB1601
TO RF GAIN
(R607 A/B)
V1602
V1603
V1604
3
4
6.3V
AC
7
8
TB1601
1
2
5
6
2-7

Figure 5—28. AM Detector-Amplifier, 80 Kc IF Amplifier, Functional Schematic Diagram


(TP) J1602
44
TO PIN 1 V1602
C1605 100
44 A4
R1611 470K
R1612 47K
C1606 510
AGC (FROM CR1601)
S1602
1.0
3.0
.35
12.0
C1665 7-45
C1666 7-45
C1667 7-45
R1606 1MEG
FL1601
FL1602
FL1603
350 CPS (BW)
1.0KC (BW)
3.0KC (BW)
RF SELECTIVITY BW-KCS
44 A6
44 A3
44 A7
44 A5
C1662 7-45
C1663 7-45
C1664 7-45
R1610 100K
R1608 100K
R1607 47K
R1609 1K
R1605 10K
T1601
C1604 100
12KC (BW)
44 A4
V1601 4
6.3V
C1661 1000
C1660 1000
TB1601
S1601
A
B
C
R1604 4.7K
+160V
TB1601-13
C1603 1000
42
R1603 180K
C1602 .15µf
R1601 330
C1601 .22µf
44 A1
44 A2
V1601 5654 IF AMPL
R1672 10K
R1602 10K
GAIN BAL
(TP) J1609
43
J1601
FROM 80KC FILTER (J1303)

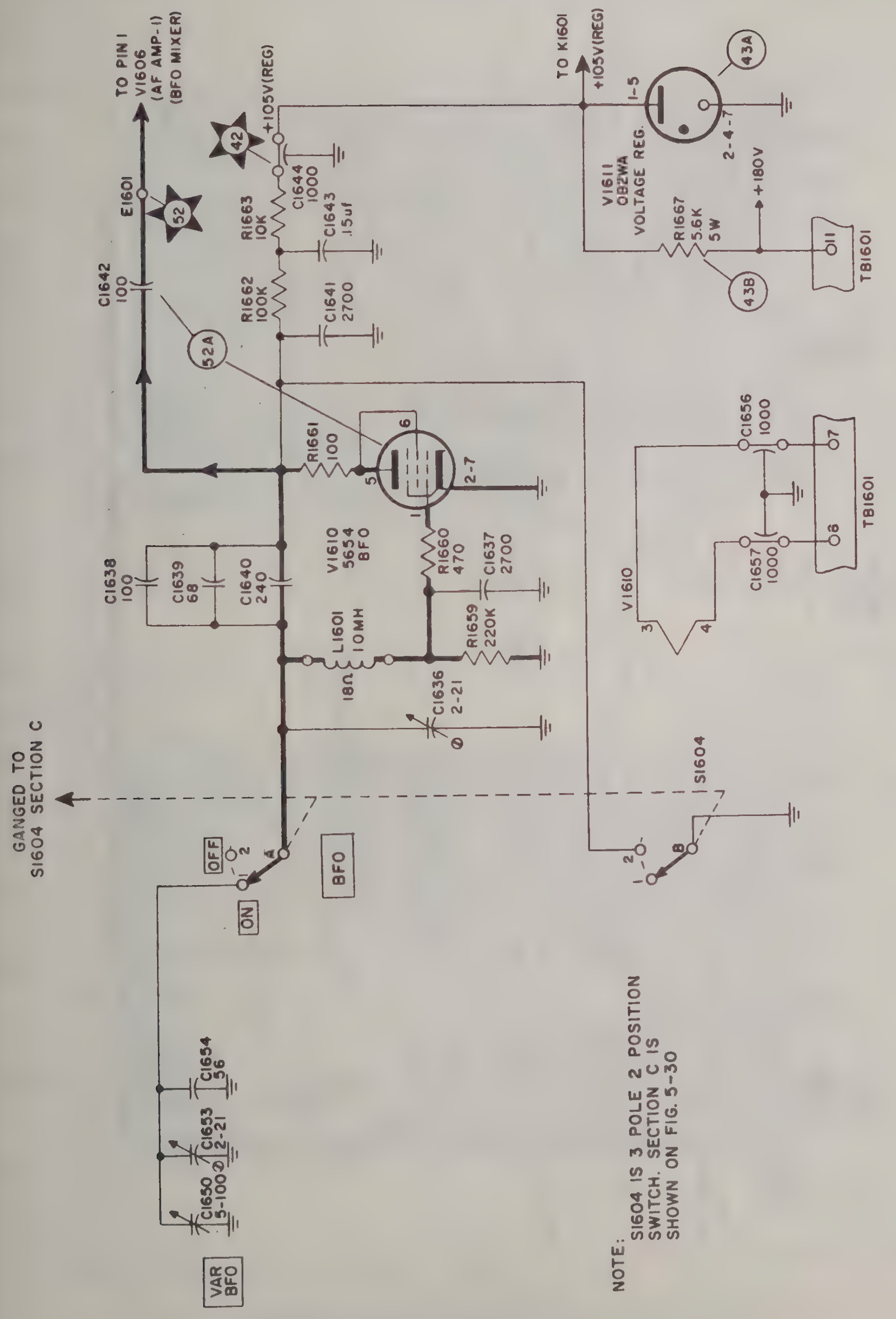
NOTE:
S1601-S1602 ARE 4 POS. 3 POLE, SINGLE DECK SWITCHES.

Figure 5—29. AM Detector-Amplifier, RF Bandpass Selector, Functional Schematic Diagram


50
(TP) J1610
50B
T1604
FROM
80KC
IF AMPL
1
2
3
4
C1618
150
C1627
510
R1638
120K
+CR1603
1N458
(DET.)
C1628
150
R1636
27K
R1639
100K
CR1604
1N458
(ANL)
R1637
33K
C1630
.015uf
R1640
100K
R1641
100K
C1629
510
C1631
.15uf
50C
BFO
S1604
C
1
2
ON
OFF
V1606
5725
1ST AF AMPL &
BFO MIXER
R1643
220K
R1644
1K
C1632
.15uf
R1674
1K
R1642
220K
C1633
.047uf
R1646
10K
R1645
18K
R1675
47K
R1676
47K
510
C1668
510
C1669
510
C1670
AM
AF LEVEL
R1647
50K
+150V
9
TB1601
51
(TP) J1606
V1607
5654
2ND AF
AMPL
2-7
R1649
470
1W
R1650
47K
1W
C1634
.033uf
TO
V1608A
(3RD AF)
42
+160V
13
TB1601
3
4
2
E1601
52
FROM
BFO
GANGED TO
S1604, SECTION
A AND B
51D
V1608B
1/2 12AT7WA
SILENCER
AGC
(FROM CR1601)
R1651
2.2 MEG
R1648
33K
8K
K1601
51B
PART OF R1664
(OPENS CCW)
51C
R1665
22K
R1664
100K
SILENCER
43
C1644
1000
FROM REG.
V1611
+105V
V1606
V1607
V1608
TB1601
7
8

NOTE:
FOR SECTIONS A AND B
OF S1604 SEE FIG. 5–31

Figure 5–30. AM Detector-Amplifier, Detector, Automatic Noise Limiter, Audio Silencer, and Audio Amplifier, Functional Schematic Diagram


TO PIN 1
V1606
(AF AMP-1)
(BFO MIXER)
E1601
52
42
+105V(REG)
C1642
100
R1663
10K
C1644
1000
C1643
.15uf
R1662
100K
C1641
2700
52A
R1661
100
6
5
2-7
1
V1610
5654
BFO
C1638
100
C1639
68
C1640
240
R1660
470
C1637
2700
L1601
10MH
18Ω
R1659
220K
C1636
2-21
GANGED TO
S1604 SECTION C
S1604
OFF
2
A
1
ON
BFO
2
B
1
VAR
BFO
C1650
5-100
C1653
2-21
C1654
56
TO K1601
+105V(REG)
1-5
43A
2-4-7
V1611
OB2WA
VOLTAGE REG.
+180V
R1667
5.6K
5W
43B
11
TB1601
C1656
1000
7
TB1601
8
C1657
1000
V1610
3
4

NOTE:
S1604 IS 3 POLE 2 POSITION
SWITCH. SECTION C IS
SHOWN ON FIG. 5-30

Figure 5–31. AM Detector-Amplifier, BFO, Functional Schematic Diagram

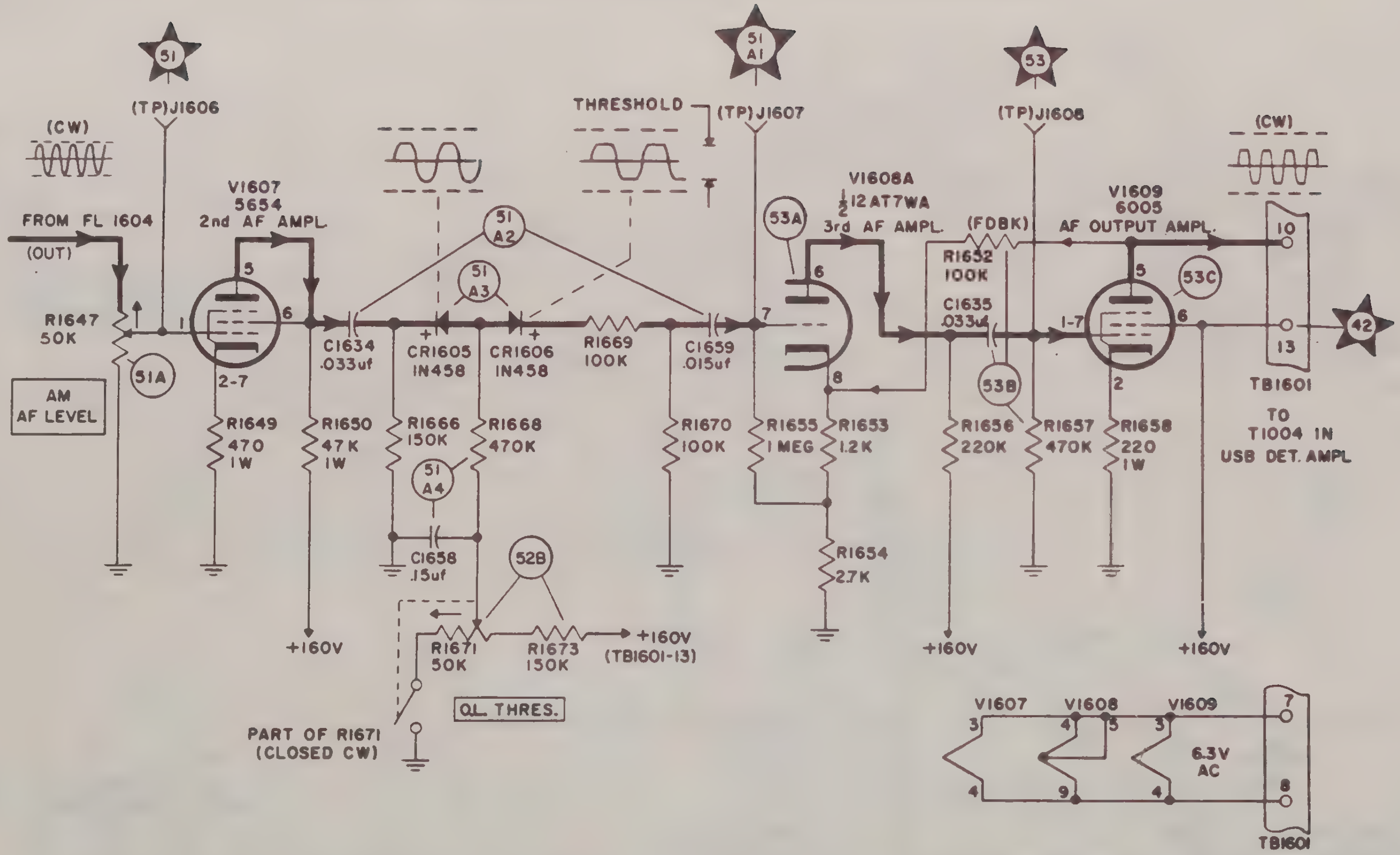

51
(TP)J1606
(CW)
FROM FL 1604
(OUT)
R1647
50K
51A
AM
AF LEVEL
V1607
5654
2nd AF AMPL.
5
6
1
2-7
R1649
470
1W
C1634
.033uf
R1650
47K
1W
+160V
51
A2
51
A3
CR1605
IN458
CR1606
IN458
R1666
150K
R1668
470K
51
A4
C1658
.15uf
52B
R1671
50K
R1673
150K
+160V
(TB1601-13)
QL THRES.
PART OF R1671
(CLOSED CW)
THRESHOLD
R1669
100K
C1659
.015uf
R1670
100K
51
A1
(TP)J1607
53A
V1608A
½ 12AT7WA
3rd AF AMPL.
6
7
8
R1655
1 MEG
R1653
1.2K
R1654
2.7K
53
(TP)J1608
(FDBK)
R1632
100K
C1635
.033uf
53B
R1656
220K
R1657
470K
+160V
V1609
6005
AF OUTPUT AMPL.
53C
5
6
1-7
2
R1658
220
1W
+160V
(CW)
10
13
TB1601
42
TO
T1004 IN
USB DET. AMPL
V1607
V1608
V1609
3
4
4
5
9
3
4
6.3V
AC
7
8
TB1601

Figure 5—32. AM Detector-Amplifier, Output Limiter and Audio Amplifier, Functional Schematic Diagram

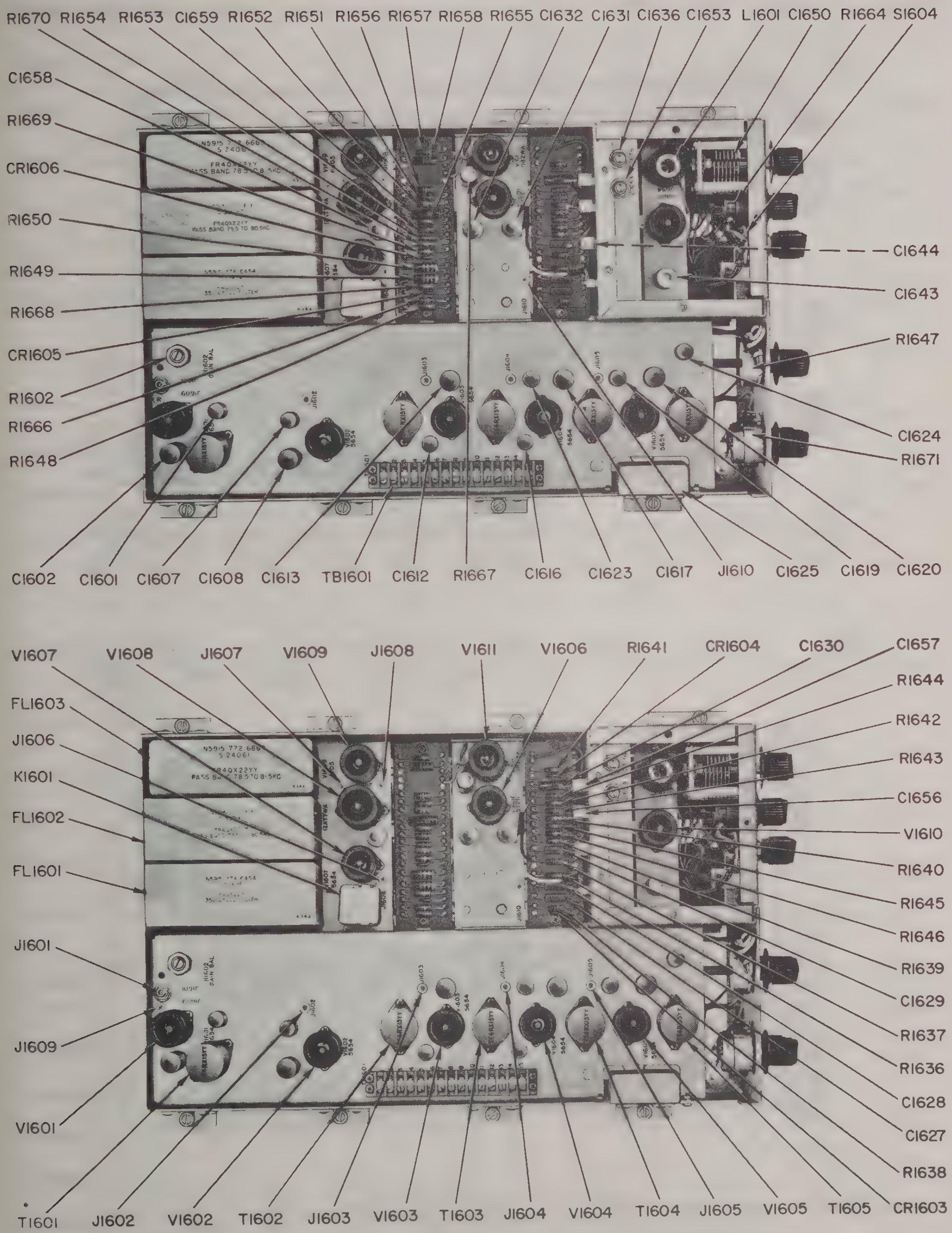

R1670
R1654
R1653
C1659
R1652
R1651
R1656
R1657
R1658
R1655
C1632
C1631
C1636
C1653
L1601
C1650
R1664
S1604
C1658
R1669
CR1606
R1650
R1649
R1668
CR1605
R1602
R1666
R1648
C1644
C1643
R1647
C1624
R1671
C1602
C1601
C1607
C1608
C1613
TB1601
C1612
R1667
C1616
C1623
C1617
J1610
C1625
C1619
C1620
V1607
V1608
J1607
V1609
J1608
V1611
V1606
R1641
CR1604
C1630
C1657
R1644
R1642
R1643
C1656
V1610
R1640
R1645
R1646
R1639
C1629
R1637
R1636
C1628
C1627
R1638
FL1603
J1606
K1601
FL1602
FL1601
J1601
J1609
V1601
T1601
J1602
V1602
T1602
J1603
V1603
T1603
J1604
V1604
T1604
J1605
V1605
T1605
CR1603

Figure 5—33. AM Detector-Amplifier, Location of Parts
(Sheet 1 of 2)

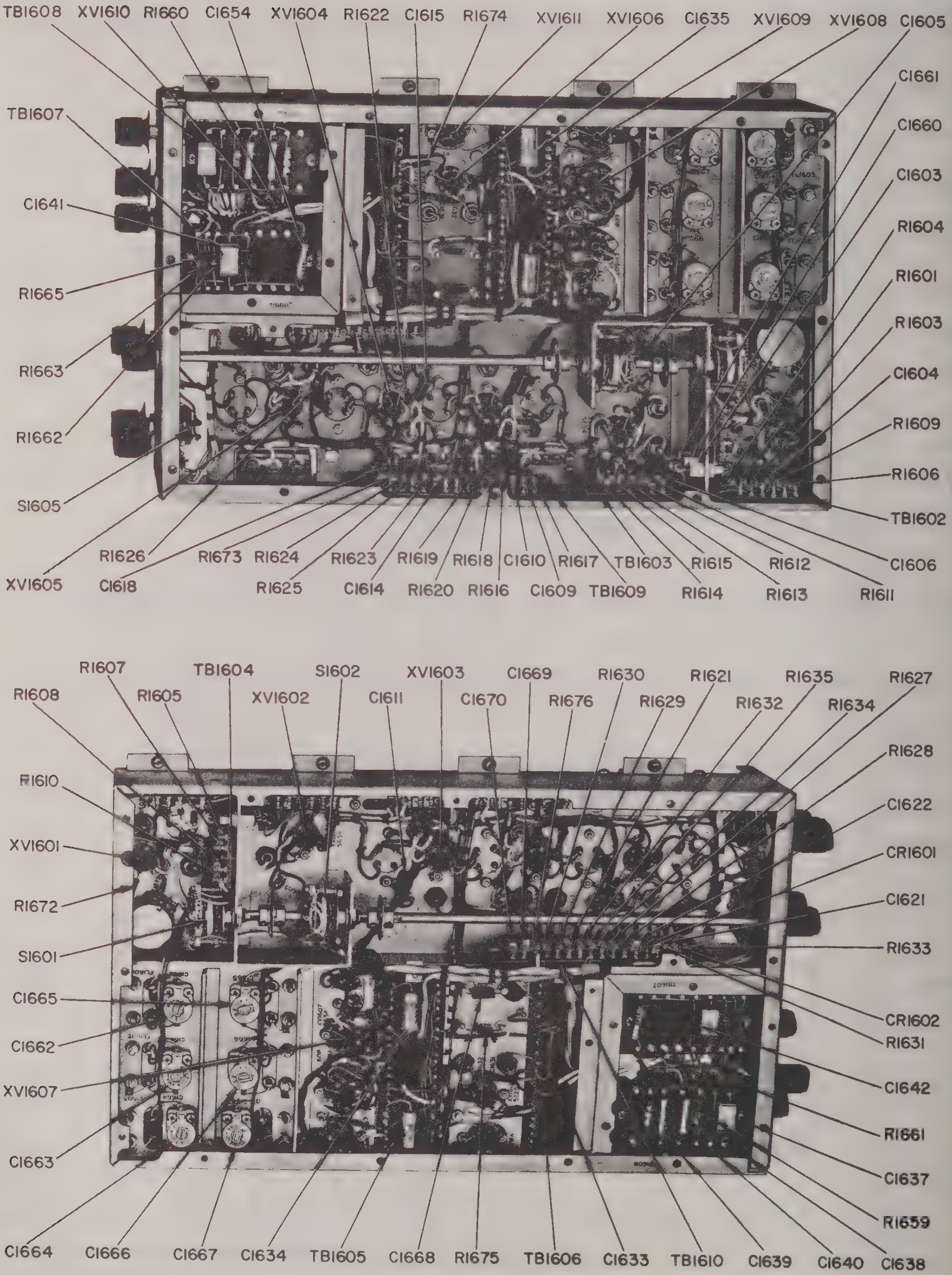

TB1608
XV1610
R1660
C1654
XV1604
R1622
C1615
R1674
XV1611
XV1606
C1635
XV1609
XV1608
C1605
C1661
C1660
C1603
R1604
R1601
R1603
C1604
R1609
R1606
TB1602
C1606
TB1607
C1641
R1665
R1663
R1662
S1605
XV1605
R1626
C1618
R1673
R1624
R1625
R1623
C1614
R1619
R1620
R1618
R1616
C1610
C1609
R1617
TB1609
TB1603
R1615
R1614
R1612
R1613
R1611
R1607
TB1604
S1602
XV1603
C1669
R1630
R1621
R1635
R1627
R1608
R1605
XV1602
C1611
C1670
R1676
R1629
R1632
R1634
R1628
C1622
CR1601
C1621
R1633
CR1602
R1631
C1642
R1661
C1637
R1659
C1638
R1610
XV1601
R1672
S1601
C1665
C1662
XV1607
C1663
C1664
C1666
C1667
C1634
TB1605
C1668
R1675
TB1606
C1633
TB1610
C1639
C1640

Figure 5—33. AM Detector-Amplifier, Location of Parts (Sheet 2 of 2)

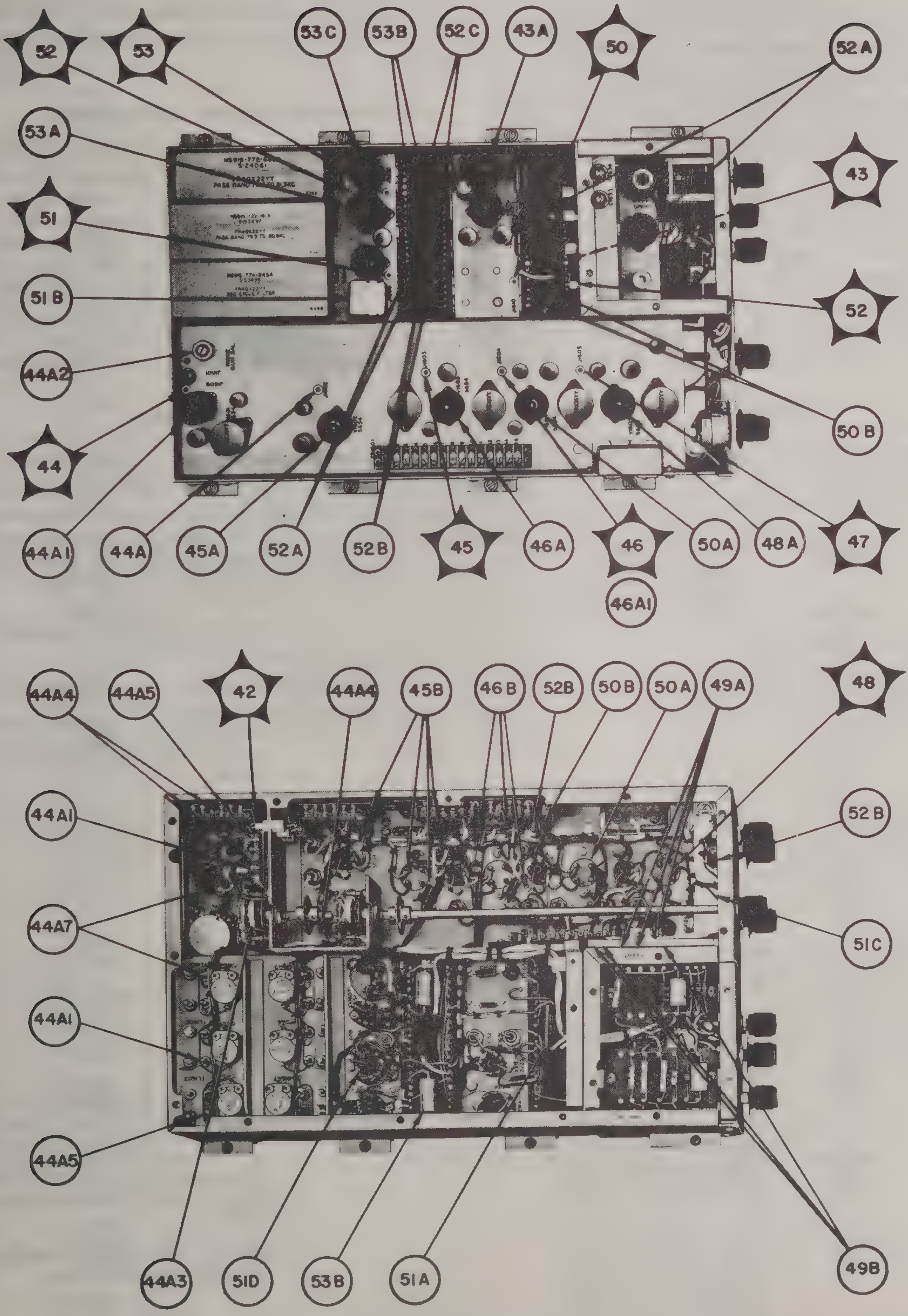

52
53
53C
53B
52C
43A
50
52A
53A
43
51
51B
52
44A2
50B
44
44A1
44A
45A
52A
52B
45
46A
46
46A1
50A
48A
47
44A4
44A5
42
44A4
45B
46B
52B
50B
50A
49A
48
44A1
52B
44A7
51C
44A1
44A5
44A3
51D
53B
51A
49B

Figure 5–34. AM Detector-Amplifier, Location of Test Points

WARNING

Potentials as high as 210 volts rms are present in the power supply circuits. Avoid contact.

d. TEST EQUIPMENT AND SPECIAL TOOLS.— Use Multimeter AN/PSM-4B, VTVM ME-30/U, VTVM ME-6D/U, Signal Generator AN/URM-25D, and Oscilloscope OS-8C/U. No special tools are required.

e. CONTROL SETTINGS.— Place the panel controls in the positions listed in table 5-2. Exceptions will be made during the trouble-shooting procedure.

f. AM DETECTOR-AMPLIFIER TROUBLE-SHOOTING CHART.— Table 5-9 is the trouble-shooting chart for the AM detector-amplifier. Perform the steps in the order given. Compare the results with those in the NORMAL INDICATION column and follow the instructions given in the NEXT STEP column. Voltage and resistance measurements are given in table 6-8.

5-14. HIGH-FREQUENCY OSCILLATOR.

a. FUNCTION.— The high-frequency (HF) oscillator (V301) generates a local RF signal, which is applied to the preselector mixer (V151) to heterodyne the received signal to the first IF frequency of 1,625 kc to 1,725 kc and which is applied also to the harmonic amplifier mixer (V251) to generate the 825 kc injection signal. Faulty operation of the HF oscillator will affect the output of both the preselector mixer and the injection signal, disabling the receiver. Figure 5-35 is a functional schematic diagram of the HF oscillator.

TABLE 5-9. AM DETECTOR-AMPLIFIER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	41 42 Figs. 5-27 5-28 5-29 5-30 5-31 5-32 5-33 5-34 Table 6-8	Measure dc supply voltage from TB1601, pin 13 to chassis. Use Multimeter selecting the 200 vdc range. Tolerance ±20%.	TB1601-13: +170 vdc	If indication is abnormal, perform steps in table 5-6. Check C1603. Check for shorts in the plate supply line. WARNING Turn off power before making ohmmeter measurements.
			C1644: +105 vdc ±5% tol.	If indication is abnormal, replace V1611; if still abnormal, perform steps in table 5-6. Check R1644 and R1667.
	43B	Measure dc supply voltage at TB1601-11.	TB1601-11: +180 vdc	If indication is abnormal, refer to table 5-6.
2	43 45 Figs. 5-27 5-28	Remove cable W654 and connect signal generator to J1601. Adjust for an 80 kc (30 uv) unmodulated output. Place the RF GAIN and AM AF LEVEL controls clockwise. Measure signals at TP J1603 for each position of the RF SELECTIVITY BW KC control with VTVM ME-30/U. Tolerance 10%.	TP J1603 12:0: .003 v rms 3.0: .005 v rms 1.0: .004 v rms .350: .015 v rms	If indication is abnormal, check V1601 and V1602. Check socket pin voltages with table 6-8. Check adjustment of R1602 GAIN BAL control. (See par. 6-4*d*) for adjustment information.) Check T1601, T1602, FL1601, FL1602, FL1603, and S1601-1602. Return RF SELECTIVITY BW-KCS control to the 12.0 position.

TABLE 5-9. AM DETECTOR-AMPLIFIER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	44A4 to 44A7			
3	46 Fig. 5-28	With signal generator connected and adjusted as in step 2, measure signal at TP J1604, with VTVM ME-30/U.	TP J1604: .07 v rms (minimum)	If indication is abnormal, replace V1603. Check socket pin voltages. Check T1603.
4	50 Fig. 5-30	With signal generator connected as in step 2, adjust for an 80 kc, 26 uv output modulated 30% with 400 cps. Measure rectified signal at TP J1610 with a VTVM in the dc range.	TP J1610: .03 vdc (minimum)	If indication is abnormal, replace V1604. Check socket pin voltages. Check CR1603 and T1604.
5	51 Figs. 5-30 5-32	With signal generator connected and adjusted as in step 4, measure the audio signal at test points with VTVM ME-30/U.	TP J1606: .13 v rms	If indication is abnormal, replace V1606. Check socket pin voltages. Check (R1675, R1676, C1668, C1669, C1670). If still abnormal, check the silencer circuit; see step 8.
	52A1		TP J1607: 0.9 v rms	If indication is abnormal, replace V1607. Check socket pin voltages. If still abnormal, check the output limiter circuit; see step 9.
	Fig. 5-32		TP J1608: 1.9 v rms	If indication is abnormal, replace V1608. Check socket pin voltages.
	53 Fig. 5-32 53C 138 Figs. 5-77 5-79		J1802: 1.9 v rms LINE A (600 ohm load connected)	If indication is abnormal, replace V1609. Check socket pin voltages.

TABLE 5-9. AM DETECTOR-AMPLIFIER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
6	47 Fig. 5-27	To test the AGC amplifier circuit, adjust the signal generator (still connected to J1601) for an 80 kc output (30 uv), unmodulated. Measure signal at TP J1605 with VTVM ME-30/U.	TP J1605: .05 v rms (minimum)	If indication is abnormal, replace V1603. Check socket pin voltages. Check T1603.
	48 Fig. 5-27	Place the AM-AGC TIME CONSTANT control in FAST position and measure AGC voltage at terminal 4 of T1605 with VTVM.	Terminal 4 of T1605: —5 vdc (minimum)	If indication is abnormal, replace V1605. Check socket pin voltages. Check T1605 and CR1601.
	49	Measure AGC voltage on AGC buss at TB-1601 with VTVM.	TB1601 terminal 12: —5 vdc (minimum)	If indication is abnormal, check diode CR1602 and resistors R1631, R1633, R1634, and R1635.
7	52 Fig. 5-31 52A	To test the BFO circuit place the BFO control in the on position. Measure the BFO output signal at E1601.	E1601: 0.5 v rms (minimum)	If indication is abnormal, replace V1610. Check socket pin voltages. Check V1611. Refer to par. 6-4*c* for BFO alignment instructions.
8	51 Fig. 5-30 51A to 51D	To test the silencer circuit connect and adjust the signal generator to J1601 as described in step 4. Measure signal at TP J1606 with VTVM ME-30/U. Turn the SILENCER control slowly clockwise until relay K1601 operates, removing signal at TP J1606.	TP J1606: .13 v rms, zero volts with SILENCER control one-half clockwise or less.	If indication is abnormal, replace V1608. Check socket pin voltages. Check K1601 and switch on R1664 (SILENCER) control.
9	Fig. 5-32 51A1 to 51A4	To test the output limiter circuit connect and adjust the signal generator as described in step 4. Connect oscilloscope to TP J1607 and adjust to show 400 cps signal (sweep rate of 100/sec approx.). Slowly turn O.L. THRES. control clockwise, noting clipping of the waveform peaks.	TP J1607: Oscilloscope waveforms. Clipping of peaks equal. Clipping increases as O.L. THRES. control is rotated clockwise.	If indication is abnormal, check diodes CR1605 and CR1606. Check C1658, R1668, R1673, and R1671.

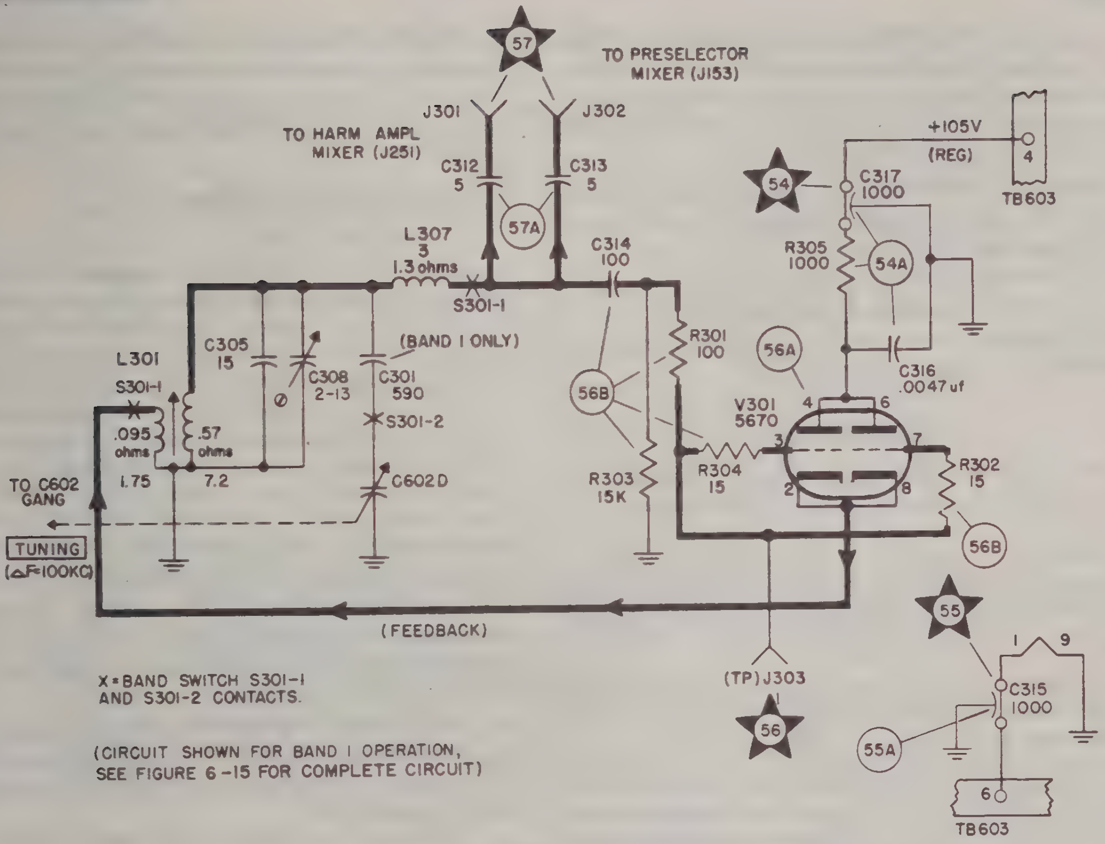

57
TO PRESELECTOR
MIXER (J153)
J301
J302
TO HARM AMPL
MIXER (J251)
+105V
(REG)
4
TB603
54
C317
1000
C312
5
C313
5
57A
L307
3
1.3 ohms
C314
100
R305
1000
54A
S301-1
R301
100
56A
C316
.0047 uf
L301
C305
15
(BAND I ONLY)
S301-1
C308
2-13
C301
590
56B
V301
5670
4
6
.095
ohms
.57
ohms
S301-2
3
7
R304
15
R302
15
TO C602
GANG
1.75
7.2
C602D
R303
15K
2
8
56B
TUNING
(ΔF≈100KC)
55
(FEEDBACK)
1
9
X = BAND SWITCH S301-1
AND S301-2 CONTACTS.
(TP) J303
C315
1000
55A
56
(CIRCUIT SHOWN FOR BAND I OPERATION,
SEE FIGURE 6-15 FOR COMPLETE CIRCUIT)
6
TB603

Figure 5-35. High-Frequency Oscillator, Functional Schematic Diagram

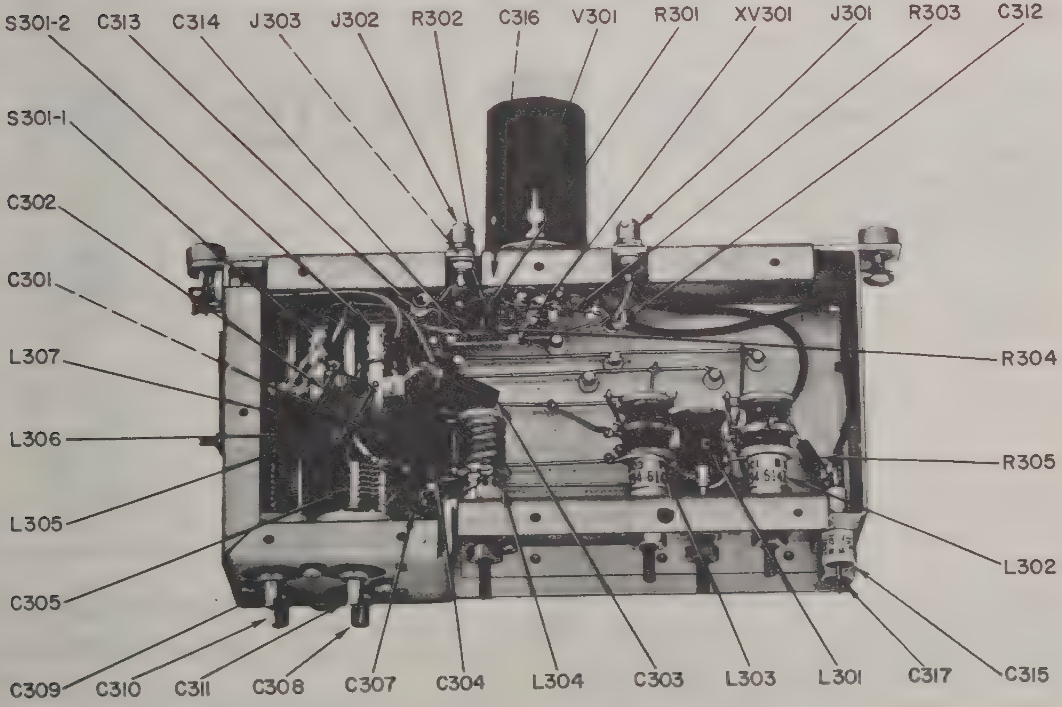

S301-2
C313
C314
J303
J302
R302
C316
V301
R301
XV301
J301
R303
C312
S301-1
C302
C301
L307
L306
L305
C305
R304
R305
L302
C309
C310
C311
C308
C307
C304
L304
C303
L303
L301
C317
C315

Figure 5-36. High-Frequency Oscillator, Location of Parts

b. ACCESS.—The HF oscillator is located in the lower converter deck. Raise the upper deck to reach the top of the oscillator, or tilt the entire converter drawer for access to the bottom of the oscillator section. Figure 5-36 shows the location of parts.

c. PRELIMINARY CHECK.—Before trouble-shooting the HF oscillator, carefully inspect the following with the power off:

(1) Seating of tube V301 in its socket

(2) Cable connections at J301 and J302

(3) Soldered connections at chassis feed-through terminals.

WARNING

Potentials as high as 210 volts rms are present in the power supply circuits. Avoid contact.

d. TEST EQUIPMENT AND SPECIAL TOOLS.—Use Multimeter AN/PSM-4B, VTVM ME-6D/U and VTVM ME-30/U, or equivalents. No special tools are required.

e. CONTROL SETTINGS.—Use the panel control settings listed in table 5-2. Place POWER switch to ON position and allow 30 seconds for warm-up.

f. HF OSCILLATOR TROUBLE-SHOOTING CHART.—Table 5-10 is the trouble-shooting chart for the HF oscillator. Perform the steps in the order given and compare the results with those in the NORMAL INDICATION column. If a reading is abnormal, follow the instructions given in the NEXT STEP column. Figure 5-37 shows the location of test points. Voltage and resistance measurements for the pins of tube V301 are as follows:

5-15. HARMONIC AMPLIFIER.

(See figure 5-38.)

a. GENERAL.—The harmonic-amplifier subassembly consists of two shielded coil boxes. One box contains the first and second harmonic amplifiers with associated coils, parts, and band switch sections; the other contains the mixer stage, including the related coils, parts, and band switch. The boxes may be removed separately. The harmonic-amplifier circuit generates 100 kc harmonics over the frequency range of 2.9 mc to 32.9 mc. It is tuned to select the proper harmonic, which, when combined with a signal from the HF oscillator, produces the first injection IF signal of 825 kc. Faulty operation of the harmonic amplifier can disable the receiver.

b. ACCESS.—The harmonic amplifier is located in the lower converter deck, with the HF oscillator, and is reached in the manner described in paragraph 5-14*b*. Figure 5-39 shows the location of parts.

c. PRELIMINARY CHECK.—Before trouble-shooting the harmonic amplifier subassembly using table 5-11, make a preliminary inspection of the following with the power off:

(1) Seating of tubes V201, V202, and V251 in their sockets

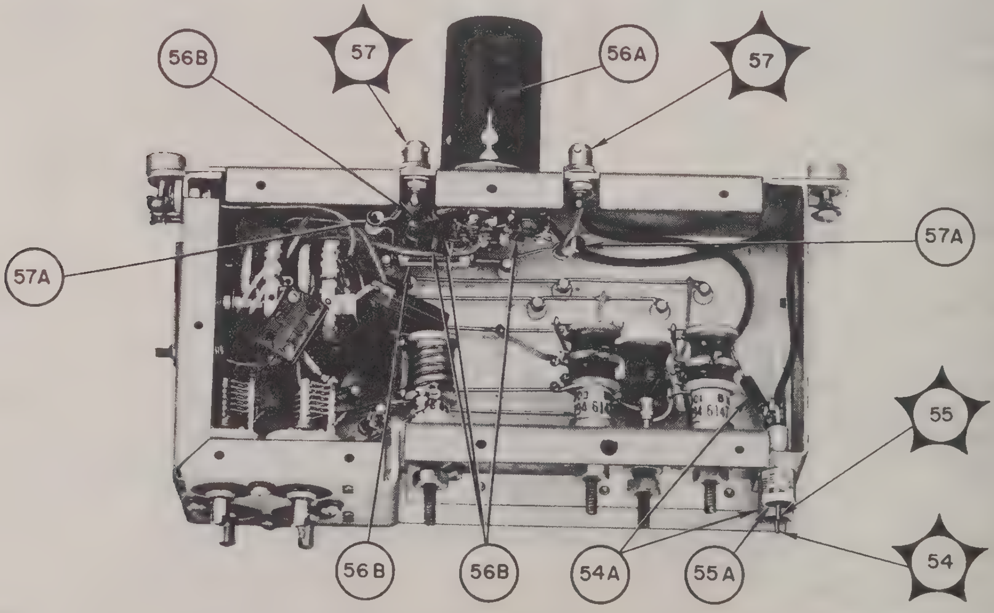


Figure 5-37. High-Frequency Oscillator, Location of Test Points

TABLE 5-10. HIGH-FREQUENCY OSCILLATOR, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	54 54A Figs. 5-35 5-36 5-37 55	Connect multimeter between chassis and feed-through capacitors. Select applicable meter range. Tolerance 10%.	C317: +105 vdc	If indication is abnormal, refer to table 5-5. Check C317, C316, and R305. WARNING Turn power off before making ohmmeter measurements.
			C315: 6.3 vac	If indication is abnormal, refer to table 5-5. Check C315.
2	56 56A 56B Figs. 5-35 5-36 5-37	Measure bias at TP J803 with VTVM on dc range. Check both ends of each frequency band by adjusting TUNING ΔF=100 KC for each measurement.	TP J803, BAND 1: 2 mc −7 vdc (minimum. 4 mc −7 vdc (minimum)	If indication is abnormal, replace V301. Check socket pin voltages. Replacing V301 may require circuit realignment (refer to par. 6-3*f*(3). Also check C314, R301, R302, R303, and R304. If an indication is abnormal for only one of the band positions, check switch contacts and tuning coils and capacitors associated with the band in which the abnormal indication was obtained.
			TP J803, BAND 2: 4 mc −5 vdc (minimum). 8 mc −4 vdc (minimum)	
			TP J803, BAND 3: 8 mc −4.8 vdc (minimum). 16 mc −2.5 vdc (minimum)	
			TP J803, BAND 4: 16 mc −5.5 vdc (minimum). 32 mc −1.1 vdc (minimum)	
3	57 57A Figs. 5-35 5-36 5-37 57 57A	Measure oscillator output at J301 or J302 with VTVM ME-30/U. Check both ends of each band as in step 2.	J301, BAND 1: 2 mc .10 v rms (minimum). 4 mc .10 v rms (minimum)	If indication is abnormal, check C312 and C313. If an indication is abnormal for only one of the band positions, check switch contacts and tuning coils and capacitors associated with the band in which the abnormal indication was obtained.
			J301, BAND 2: 4 mc .10 v rms (minimum). 8 mc .15 v rms (minimum)	
			J301, BAND 3: 8 mc .15 v rms (minimum). 16 mc .20 v rms (minimum)	
			J301, BAND 4: 16 mc .25 v rms (minimum). 32 mc .25 v rms (minimum)	

(2) Cable connections at J201, J251 and J252

(3) All soldered connections at chassis feed-through terminals.

d. TEST EQUIPMENT AND SPECIAL TOOLS.—Use Multimeter AN/PSM-4B, VTVM ME-30/U, Signal Generator AN/URM-25D, and Oscilloscope OS-8C/U, or their equivalents. No special tools are required.

e. CONTROL SETTINGS.—The control settings are listed in table 5-2. Place the POWER switch in the ON position and wait 30 seconds before making voltage measurements.

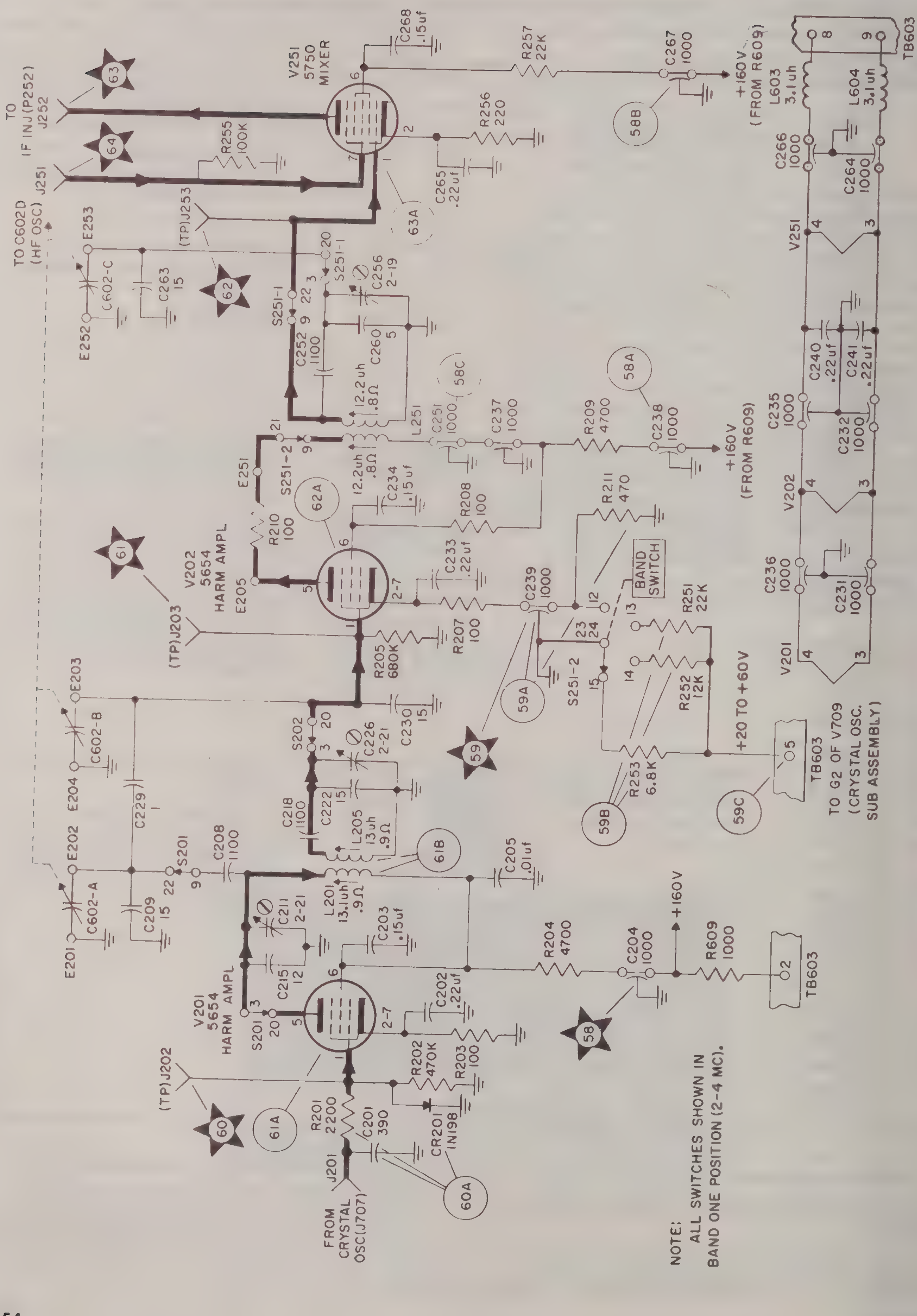
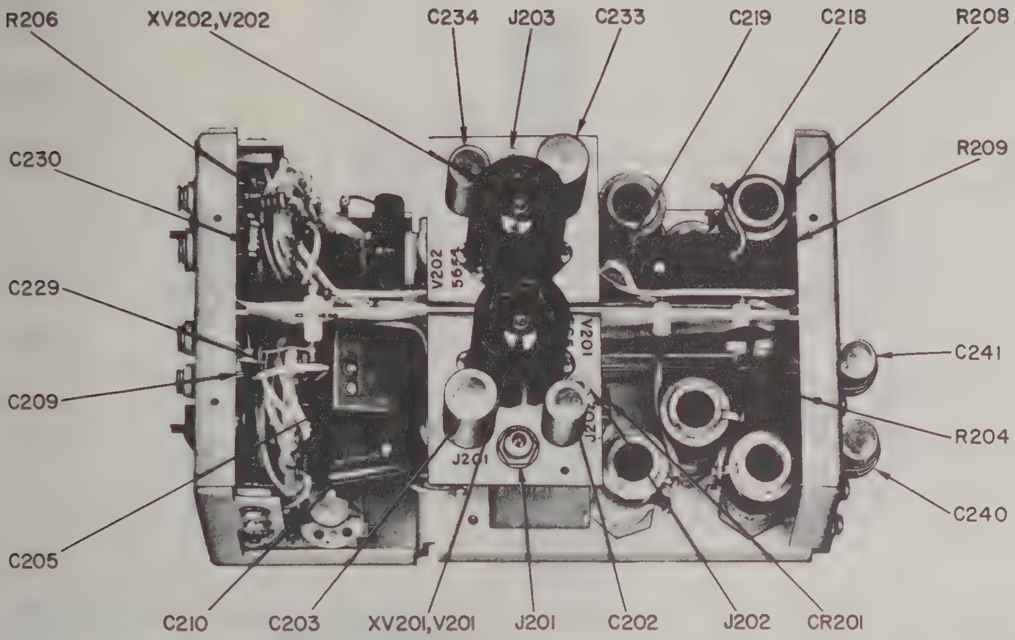
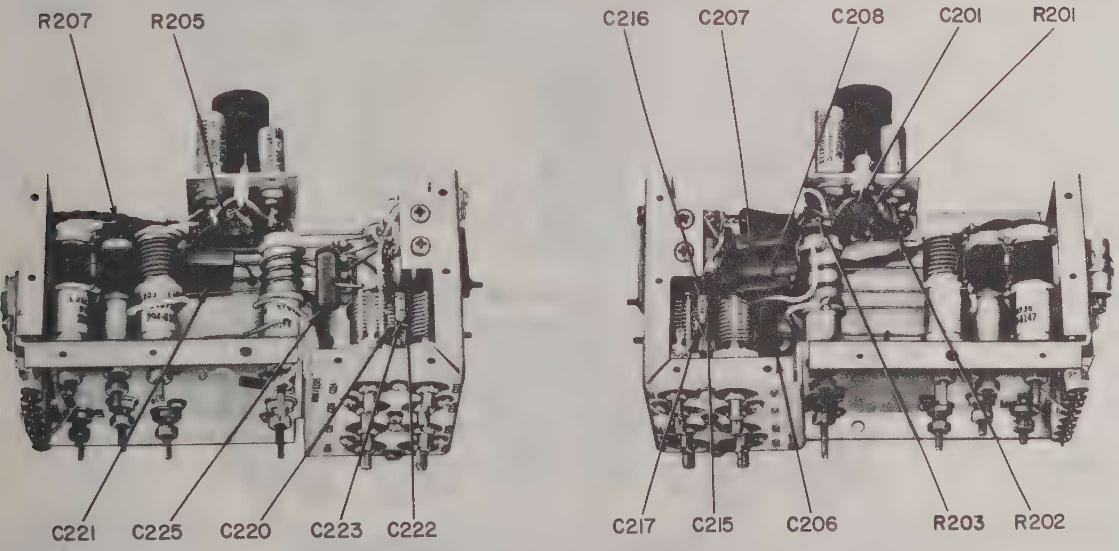

FROM CRYSTAL OSC(J707)
J201
C201 390
R201 2200
CR201 1N198
60A
60
(TP)J202
61A
R202 470K
R203 100
V201 5654 HARM AMPL
S201 20 3
C202 .22uf
C215 12
C211 2-21
L201 13.1uh .9Ω
C203 .15uf
C205 .01uf
R204 4700
C204 1000
+160V
R609 1000
TB603 2
58
E201
C602-A
C209 15
E202
S201 22 9
C208 1100
C229 1
E204
C602-B
E203
61B
L205 13uh .9Ω
C218 1100
C222 15
C226 2-21
S202 3 20
C230 15
R205 680K
(TP)J203
61
V202 5654 HARM AMPL
E205
R207 100
C233 .22uf
C239 1000
59
59A
S251-2
23 24 15 14 13 12
BAND SWITCH
R251 22K
R252 12K
R253 6.8K
59B
+20 TO +60V
TB603 5
59C
TO G2 OF V709 (CRYSTAL OSC. SUB ASSEMBLY)
R211 470
R208 100
62A
R210 100
C234 .15uf
12.2uh .8Ω
E251
S251-2 21 9
L251
C251 1000
58C
C237 1000
R209 4700
C238 1000
58A
+160V (FROM R609)
C252 1100
C260 5
S251-1 9 22 3 20
C256 2-19
62
(TP)J253
E252
C602-C
C263 15
E253
TO C602D (HF OSC)
J251 TO IF INJ(P252) J252
64
63
R255 100K
V251 5750 MIXER
63A
C265 .22uf
R256 220
C268 .15uf
R257 22K
C267 1000
58B
+160V (FROM R609)
L603 3.1uh
L604 3.1uh
TB603 8 9
C266 1000
C264 1000
V251 4 3
C240 .22uf
C241 .22uf
C235 1000
C232 1000
V202 4 3
C236 1000
C231 1000
V201 4 3
NOTE:
ALL SWITCHES SHOWN IN BAND ONE POSITION (2-4 MC).

Figure 5—38. Harmonic Amplifier, Functional Schematic Diagram


R206
XV202,V202
C234
J203
C233
C219
C218
R208
R209
C230
C229
C209
C205
C241
R204
C240
V202
V201
J201
J202
C210
C203
XV201,V201
J201
C202
J202
CR201

(Harmonic Amplifier Assembly)


R207
R205
C221
C225
C220
C223
C222
C216
C207
C208
C201
R201
C217
C215
C206
R203
R202

(Harmonic Amplifier Assembly)

(Harmonic Amplifier Assembly)

Figure 5–39. Harmonic Amplifier, Location of Parts
(Sheet 1 of 3)

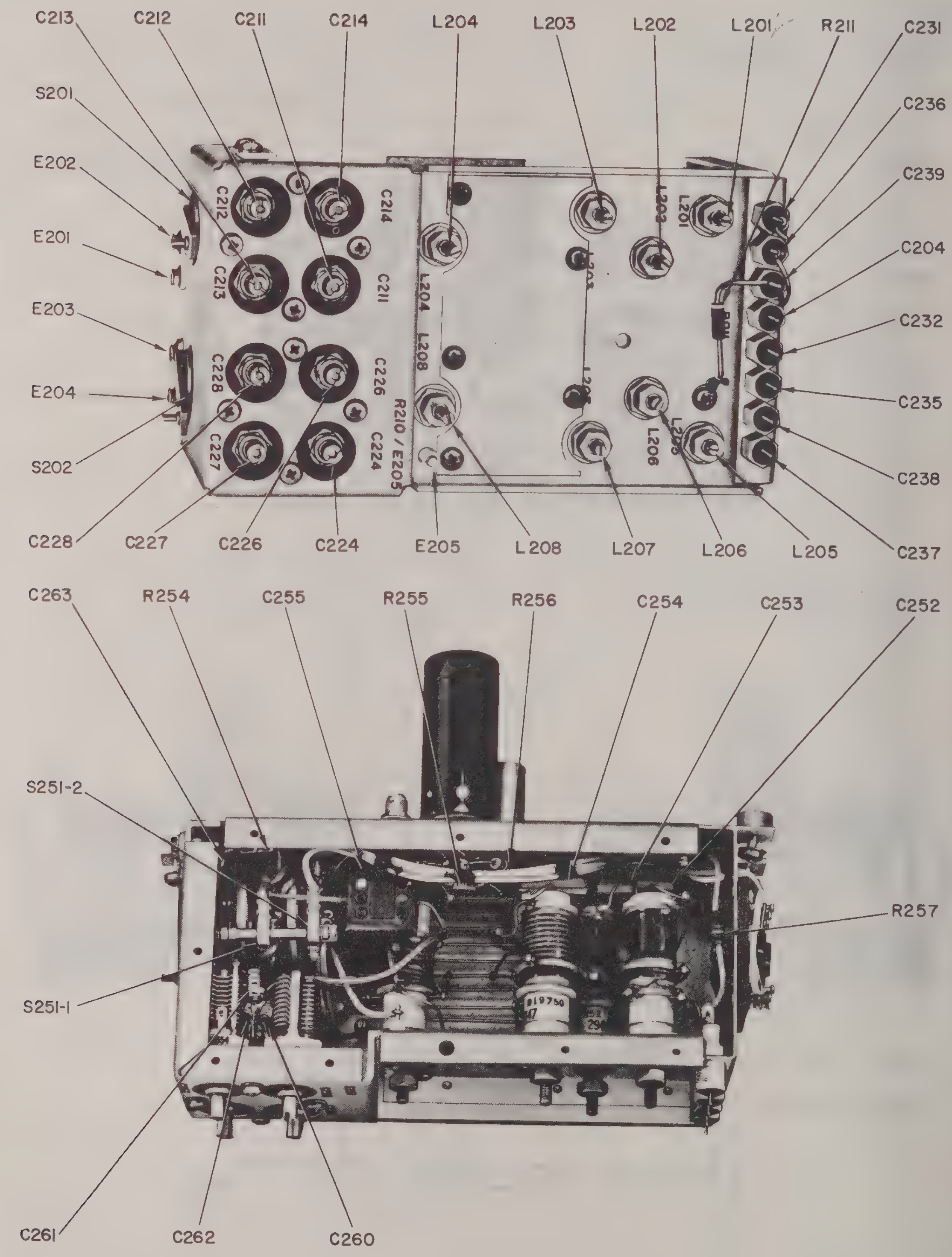

C213
C212
C211
C214
L204
L203
L202
L201
R211
C231
S201
C236
E202
C239
E201
C204
E203
C232
E204
C235
S202
C238
C228
C227
C226
C224
E205
L208
L207
L206
L205
C237
C263
R254
C255
R255
R256
C254
C253
C252
S251-2
R257
S251-1
C261
C262
C260

Figure 5–39. Harmonic Amplifier, Location of Parts
(Sheet 2 of 3)

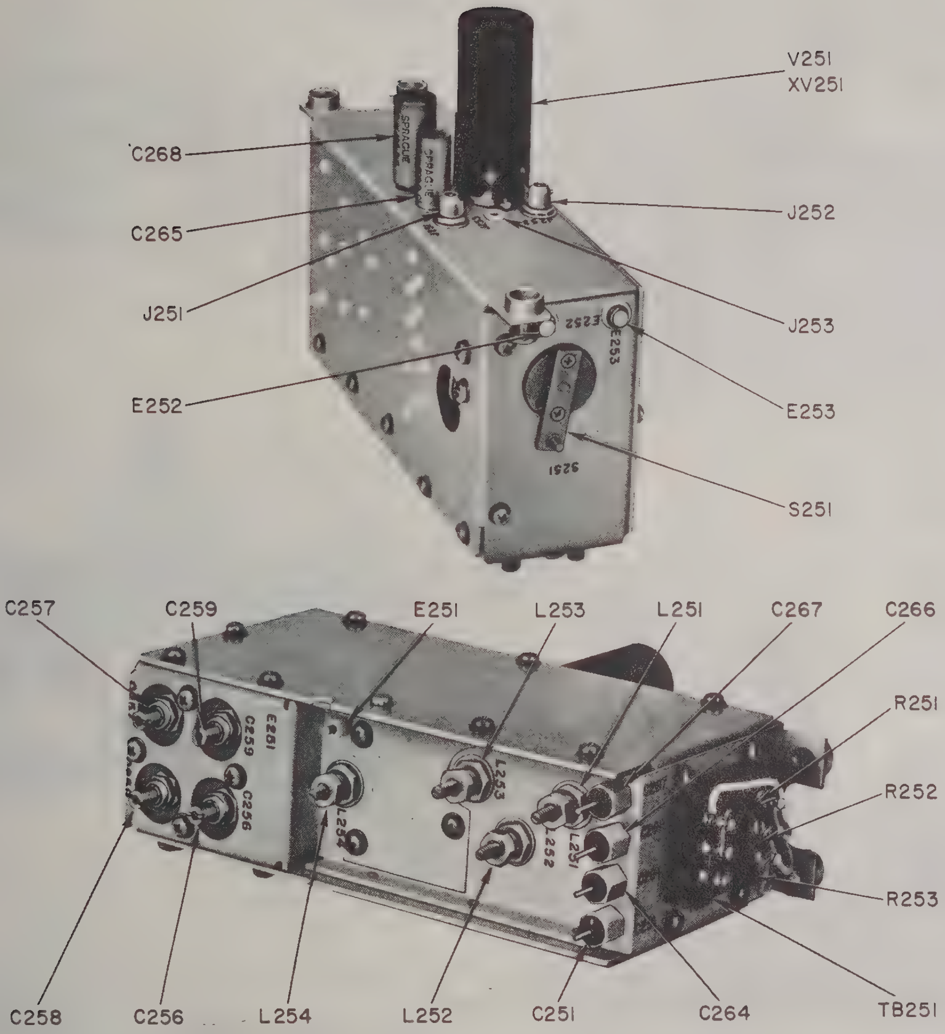


Figure 5-39. Harmonic Amplifier, Location of Parts (Sheet 3 of 3)

f. HARMONIC AMPLIFIER TROUBLE-SHOOTING CHART.—Table 5-11 is the trouble-shooting chart for the harmonic amplifier. Perform each step in the order presented. Compare the result with information in the NORMAL INDICATION column and then follow the instructions in the NEXT STEP column. Figure 5-40 shows the location of test points. Table 6-5 gives voltage and resistance measurements at the tube sockets.

5-16. INTERPOLATION OSCILLATOR.

a. FUNCTION.—Interpolation oscillator V401 generates a signal of 580 kc to 680 kc, which is applied to injection IF mixers V506 and V806. Faulty operation of the interpolation oscillator can degrade reception or disable the receiver entirely through the effect of the oscillator on the second and third conversion frequencies (220 kc and 80 kc). Figure 5-41 is a functional schematic diagram of the interpolation oscillator.

b. ACCESS.—The interpolation oscillator is located in the lower converter deck. For access to the top, index the upper deck; for access to the bottom, index the entire drawer. Figure 5-42 shows the location of parts.

c. PRELIMINARY CHECK.—With the power off, make a preliminary inspection before performing the

TABLE 5-11. HARMONIC AMPLIFIER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	☆58 58A to 58C ☆59 Figs. 5-38 5-39 5-40	Connect multimeter between chassis and feed-through capacitors. Select appropriate dc ranges, tolerance ±20%.	C204: +160 vdc C238: +160 vdc C267: +160 vdc C251: +135 vdc C239: 2.5 vdc	If indication is abnormal, see table 5-5. Check C204, C238, C267, C251, R209, and C235. WARNING Turn off power before making ohmmeter measurements. Check C239 and R211.
2	☆61 61A 61B Figs. 5-38 5-39 5-40 Table 6-5	Remove plug P201 from J201 and tube V202 from tube socket. Connect signal generator to TP J202 and adjust for a 2.9 mc output (.01 v). Measure signal at TP J203 with VTVM ME-30/U. (TUNING ΔF= 100 KC set at 2.0 mc for this step.)	TP J203: .15 v rms (minimum)	If indication is abnormal, replace V201. Check socket pin voltages using table 6-5. Check band switch S201 and S202.
3	☆62 62A Figs. 5-38 5-39 5-40 Table 6-5	Connect signal generator to TP J203 and adjust for a 2.9 mc output (.15 v). Measure signal at TP J253 with VTVM. (Replace tube V202 in its socket and remove tube V251 for this test.)	TP J253: 1.0 v rms (approximately)	If indication is abnormal, replace tube V202. Check socket pin voltages using table 6-5. Check band switch S251-1 and S251-2. Replace tube V251 in its socket.
4	☆60 60A Figs. 5-38 5-39 5-40	Connect signal generator to J201 through a .01 ufd capacitor and a 10 k resistor. Adjust for a 100 kc output (2.0 v). Connect oscilloscope to TP J202 and note the clipped waveform. (Adjust sweep to approximately 20 kc/sec.)	TP J202: Pattern shows clipping of positive alternation.	If indication is abnormal, check diode CR201 and resistors R201 and R202.

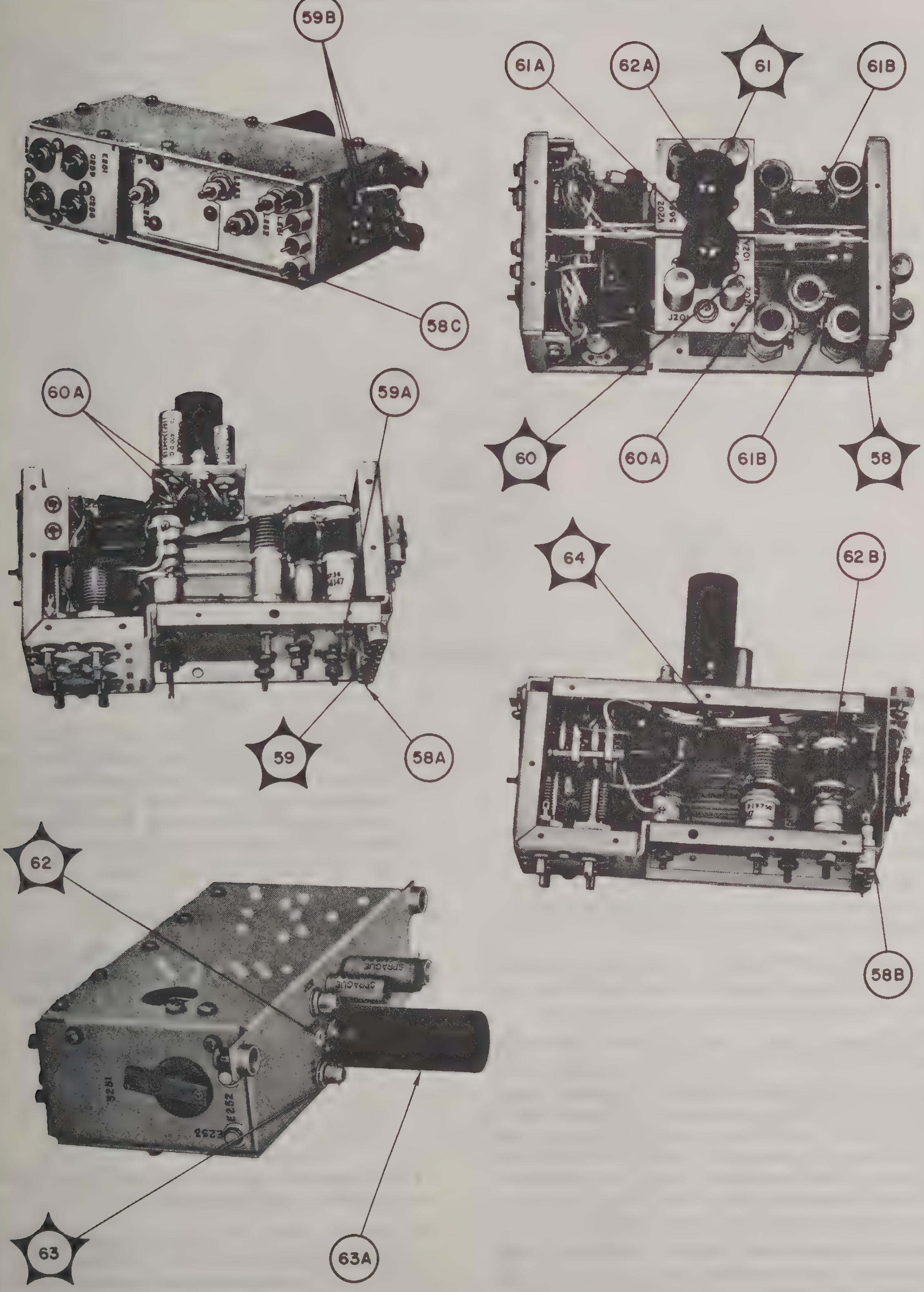

59B
61A
62A
61
61B
58C
60A
59A
60
60A
61B
58
64
62 B
59
58A
62
58B
63
63A

Figure 5—40. Harmonic Amplifier, Location of Test Points

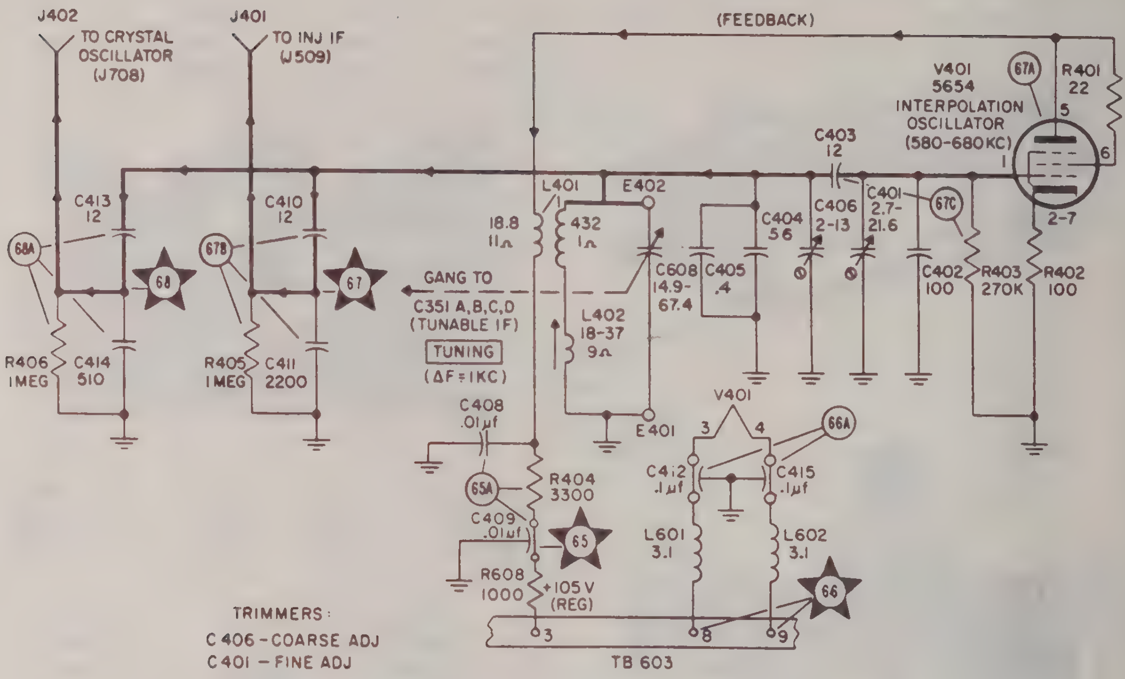

J402
TO CRYSTAL OSCILLATOR (J708)
J401
TO INJ IF (J509)
(FEEDBACK)
V401
5654
INTERPOLATION OSCILLATOR (580-680KC)
67A
R401
22
5
6
1
2-7
C403
12
C413
12
C410
12
68A
67B
68
67
L401
18.8
11Ω
E402
432
1Ω
GANG TO C351 A,B,C,D (TUNABLE IF)
TUNING
(ΔF=1KC)
C608
14.9-67.4
C405
.4
C404
56
C406
2-13
C401
2.7-21.6
67C
C402
100
R403
270K
R402
100
L402
18-37
9Ω
R406
1MEG
C414
510
R405
1MEG
C411
2200
C408
.01µf
E401
V401
3
4
66A
65A
R404
3300
C412
.1µf
C415
.1µf
C409
.01µf
65
L601
3.1
L602
3.1
R608
1000
+105 V (REG)
66
TRIMMERS:
C406-COARSE ADJ
C401 - FINE ADJ
3
8
9
TB 603

Figure 5-41. Interpolation Oscillator, Functional Schematic Diagram

trouble-shooting steps listed in table 5-12. Check the following:

(1) Seating of tube V401 in its socket

(2) Cable connections at J401 and J402

(3) All soldered connections at chassis feed-through terminals.

d. TEST EQUIPMENT AND SPECIAL TOOLS.—Use multimeter AN/PSM-4B and VTVM ME-30/U or equivalent. No special tools are needed.

e. CONTROL SETTINGS.—Set the panel controls to the position shown in table 5-2. Place POWER switch to ON position and allow 30 seconds for warm-up.

f. INTERPOLATION OSCILLATOR TROUBLE-SHOOTING CHART.—Measure the dc supply voltages before checking for normal oscillator operation. The interpolation oscillator generates signal frequencies of 580 kc to 680 kc regardless of the BAND switch position; therefore, the setting of the TUNING ΔF=100 KC control is not important. Figure 5-43 shows the location of subassembly test points. Voltage and resistance measurements for V401 socket pins follow:

To perform steps 3 and 4, expose the bottom of the interpolation oscillator subassembly and remove the cover plate. Test points ★ 67 and ★ 68 may be found at 1-megohm resistors R405 and R406.

CAUTION

Do not remove cables at connectors J401 and J402 with the equipment energized. Resistors R405 and R406 are the grid-return paths for cathode bias applied to tubes V506 and V806 in the injection IF amplifier and synthesizer subassemblies respectively. Operation of these tubes without bias is not advisable.

5-17. USB DETECTOR-AMPLIFIER.

a. DIAGRAMS.—Figure 5-44 is a functional block diagram of the USB detector-amplifier circuits. It is followed by these functional schematic diagrams:

Figure	*Circuit*
5-45	78 kc IF amplifier
5-46	AGC amplifier
5-47	USB demodulator
5-48	USB audio amplifier

For a complete schematic diagram of the USB detector-amplifier, refer to figure 6-19.

b. ACCESS.—The USB detector-amplifier is located in the lower demodulator deck. For access to the top, raise the upper demodulator deck; for access to the bottom, tilt the entire demodulator drawer. Figure 5-50 gives the location of parts.

TABLE 5-12. INTERPOLATION OSCILLATOR, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	65 65A Figs. 5-41 5-42 5-43	Measure supply voltage by connecting multimeter between chassis feed-through capacitor and chassis, using applicable dc range; tolerance 10%.	C409: +105 vdc (reg)	If indication is abnormal, refer to table 5-5. Check C409 and C408. WARNING Turn off power before making ohmmeter measurements.
2	66 66A Fig. 5-41	Measure V401 heater supply at terminals 8 and 9 of TB603. Select 10 vac multimeter range.	TB603: 6.3 vac 10% tol. (terminals 8-9)	If indication is abnormal, refer to table 5-5. Check C412 and C415. Check filament chokes L601 and L602.
3	67 67A 67B 67C Figs. 5-41 5-42 5-43	Connect VTVM between chassis and junction of R405 and C411. Measure the 580 to 680 kc output signal for two positions of the TUNING (ΔF= 0.5 KC) control.	R405: (junction) 001.0 kc 0.1 v rms. 099.9 kc 0.1 v rms (minimum)	If indication is abnormal, replace V401. Check socket pin voltage, using V-R table. Check R405, C410, C411, C403, and R403.
4	68 68A Figs. 5-41 5-42 5-43	Measure output signal at the junction of R406 and C414 with VTVM, as described in step 3.	R406: (junction) 001.0 kc 0.1 v rms. 099.9 kc 0.1 v rms (minimum)	If indication is abnormal, check R406, C413, and C414.

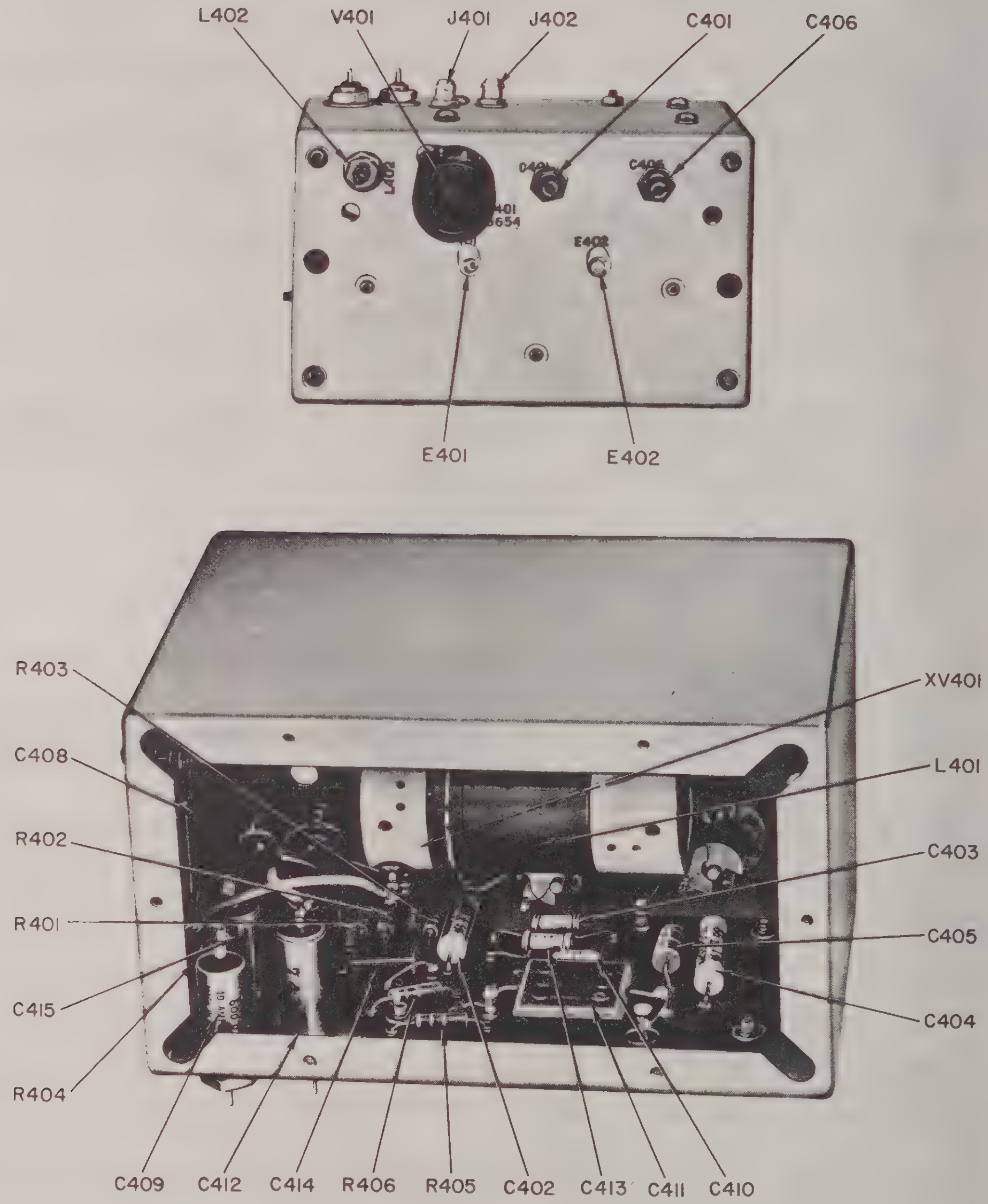

L402
V401
J401
J402
C401
C406
E401
E402
R403
C408
R402
R401
C415
R404
XV401
L401
C403
C405
C404
C409
C412
C414
R406
R405
C402
C413
C411
C410

Figure 5-42. Interpolation Oscillator, Location of Parts

c. PRELIMINARY CHECK.—Faulty operation of the USB detector-amplifier will affect reception of both upper and lower sidebands because IF amplifier V1003 is common to both. Before trouble-shooting the USB detector-amplifier—and with the power off—make a preliminary inspection, stressing the following:

(1) Seating of tubes V1001 through V1008 in their sockets

(2) Cable connections J1001 through J1003 and TB1001

(3) Soldered connections at chassis feed-through terminals

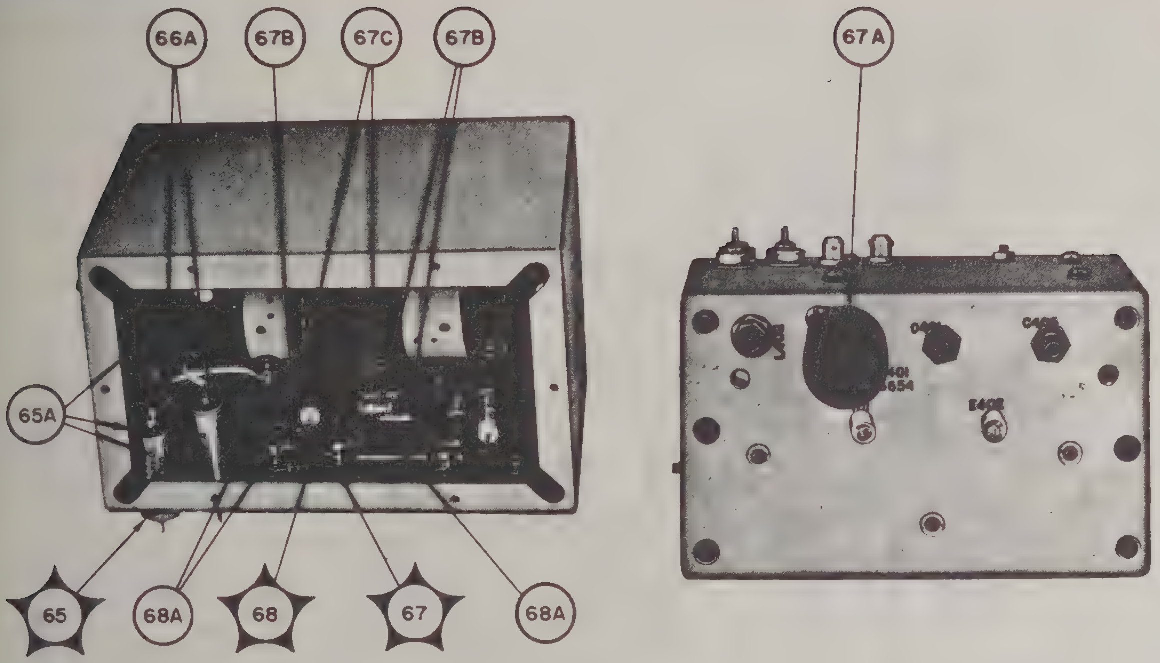

66A
67B
67C
67B
67A
65A
65
68A
68
67
68A

Figure 5-43. Interpolation Oscillator, Location of Test Points

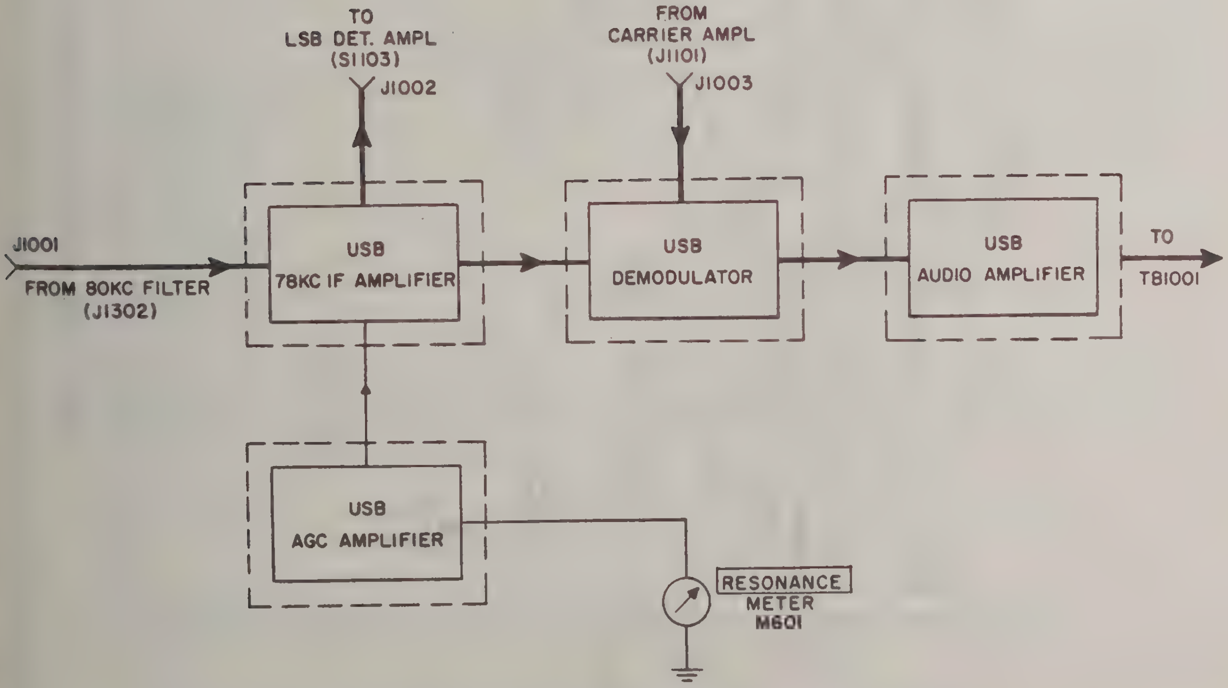

TO
LSB DET. AMPL
(S1103)
J1002
FROM
CARRIER AMPL
(J1101)
J1003
J1001
FROM 80KC FILTER
(J1302)
USB
78KC IF AMPLIFIER
USB
DEMODULATOR
USB
AUDIO AMPLIFIER
TO
TB1001
USB
AGC AMPLIFIER
RESONANCE
METER
M601

Figure 5-44. USB Detector-Amplifier, Functional Block Diagram

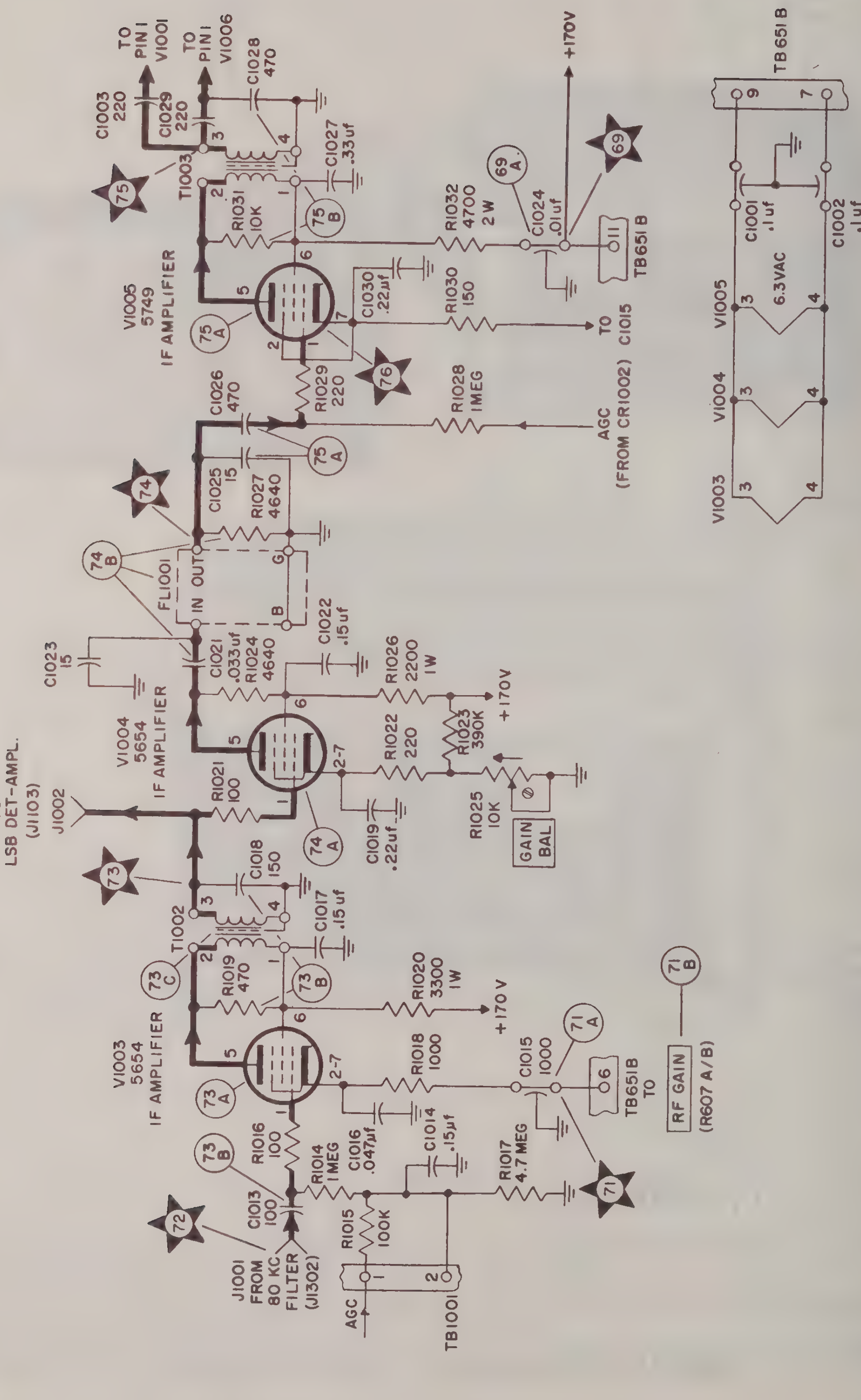

J1001
FROM
80 KC
FILTER
(J1302)
AGC
TB1001
1
2
R1015
100K
C1013
100
72
73 B
R1016
100
R1014
1 MEG
C1016
.047µf
C1014
.15µf
R1017
4.7 MEG
71
V1003
5654
IF AMPLIFIER
73 A
1
2-7
5
6
R1018
1000
C1015
1000
71 A
6
TB651B
TO
RF GAIN
(R607 A/B)
71 B
R1019
470
73 C
73 B
R1020
3300
1W
+170 V
T1002
2
1
3
4
C1017
.15 uf
C1018
150
73
TO
LSB DET-AMPL.
(J1103)
J1002
R1021
100
74 A
V1004
5654
IF AMPLIFIER
C1019
.22uf
R1022
220
R1023
390K
R1025
10K
GAIN
BAL
R1024
4640
R1026
2200
1W
+170V
C1021
.033uf
C1022
.15uf
C1023
15
74 B
FL1001
IN
OUT
B
G
74
R1027
4640
C1025
15
C1026
470
75 A
R1028
1MEG
AGC
(FROM CR1002)
R1029
220
76
V1005
5749
IF AMPLIFIER
75 A
C1030
.22µf
R1030
150
TO
C1015
R1031
10K
75 B
T1003
75
C1027
.33uf
C1003
220
C1029
220
C1028
470
TO
PIN 1
V1001
TO
PIN 1
V1006
R1032
4700
2W
69 A
C1024
.01uf
69
11
TB651 B
+170V
V1003
V1004
V1005
3
4
6.3VAC
C1001
.1uf
C1002
.1uf
9
7
TB651 B

Figure 5—45. USB Detector-Amplifier, 78 Kc IF Amplifier, Functional Schematic Diagram

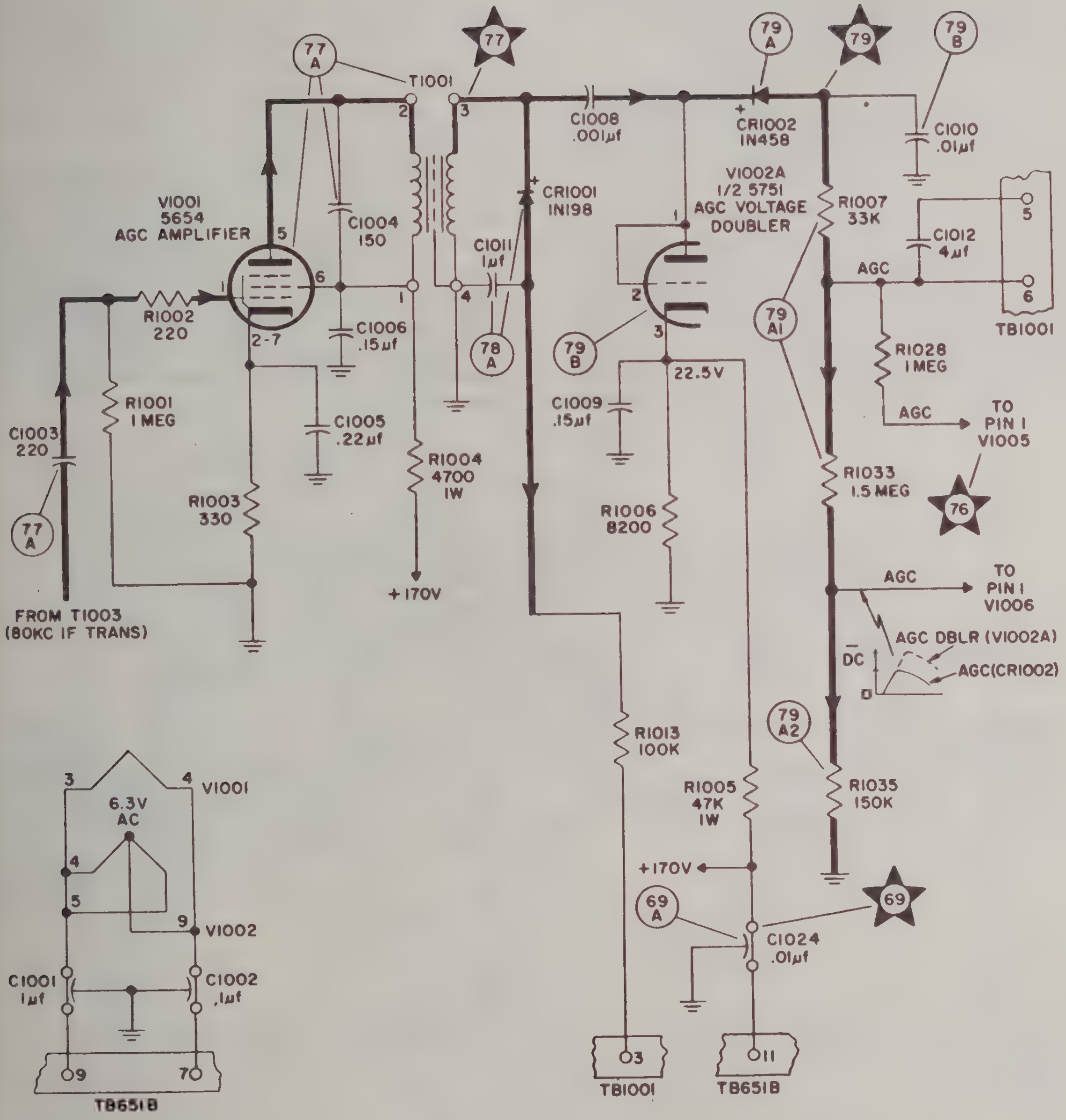

77 A
77
T1001
79 A
79
79 B
2
3
C1008
.001µf
CR1002
IN458
C1010
.01µf
V1001
5654
AGC AMPLIFIER
C1004
150
CR1001
IN198
V1002A
1/2 5751
AGC VOLTAGE
DOUBLER
R1007
33K
5
C1012
4µf
C1011
1µf
AGC
1
5
6
1
4
2
6
R1002
220
C1006
.15µf
2-7
78 A
79 B
3
79 A1
TB1001
22.5V
R1028
1MEG
R1001
1MEG
C1009
.15µf
AGC
TO
PIN 1
V1005
C1003
220
C1005
.22µf
R1004
4700
1W
R1033
1.5 MEG
76
R1003
330
R1006
8200
77 A
AGC
TO
PIN 1
V1006
+170V
FROM T1003
(80KC IF TRANS)
AGC DBLR (V1002A)
DC
AGC(CR1002)
0
79 A2
R1013
100K
3
4
V1001
6.3V
AC
R1005
47K
1W
R1035
150K
4
5
+170V
69 A
69
9
V1002
C1024
.01µf
C1001
1µf
C1002
.1µf
9
7
3
11
TB6518
TB1001
TB6518

Figure 5-46. USB Detector-Amplifier, AGC Amplifier, Functional Schematic Diagram

(4) Operation of panel controls A.F. LEVEL LINE A, A.G.C. UPPER ON/S.S.B./OFF, A.G.C. UPPER SLOW/FAST, and RECEPTION.

d. TEST EQUIPMENT.—To perform the tests listed in table 5-13, use Multimeter AN/PSM-4B, VTVM ME-30/U, and Signal Generator AN/URM-25D. No special tools are required.

e. CONTROL SETTINGS.—Use the control settings given in table 5-2. Exceptions are given in table 5-13 when required. Place POWER switch to the ON position and allow 30 seconds for warm-up.

f. USB DETECTOR-AMPLIFIER TROUBLESHOOTING CHART.—The test steps described in table 5-13 include measurements of initial supply voltages, and stage-by-stage signal tracing. Compare the result of each step with the information given in the NORMAL INDICATION column and follow instructions given in the NEXT STEP column. Perform the steps in the order shown. Figure 5-50 shows the location of test points and table 6-9 provides voltage-resistance measurements for the tube sockets.

5-18. CRYSTAL OSCILLATOR.

a. GENERAL.—The crystal oscillator subassembly (figure 5-51) contains three circuit sections—the crystal oven oscillator and amplifier (figure 5-52), the crystal oscillator and amplifier (figure 5-53), and the crystal oscillator frequency divider (figure 5-54). For a complete schematic diagram of the crystal oscillator subassembly, refer to figure 6-17.

Standard frequency signals provided by the crystal oscillator circuits are applied to the frequency divider, the synthesizer, and the harmonic amplifier. Faulty operation of the crystal oscillator can affect the accuracy of receiver frequency calibration or disable the receiver completely, because the absence of a standard frequency signal can prevent production of the second and third conversion frequencies (220 kc and 80 kc) and disrupt operation of the injection IF amplifier and synthesizer circuits.

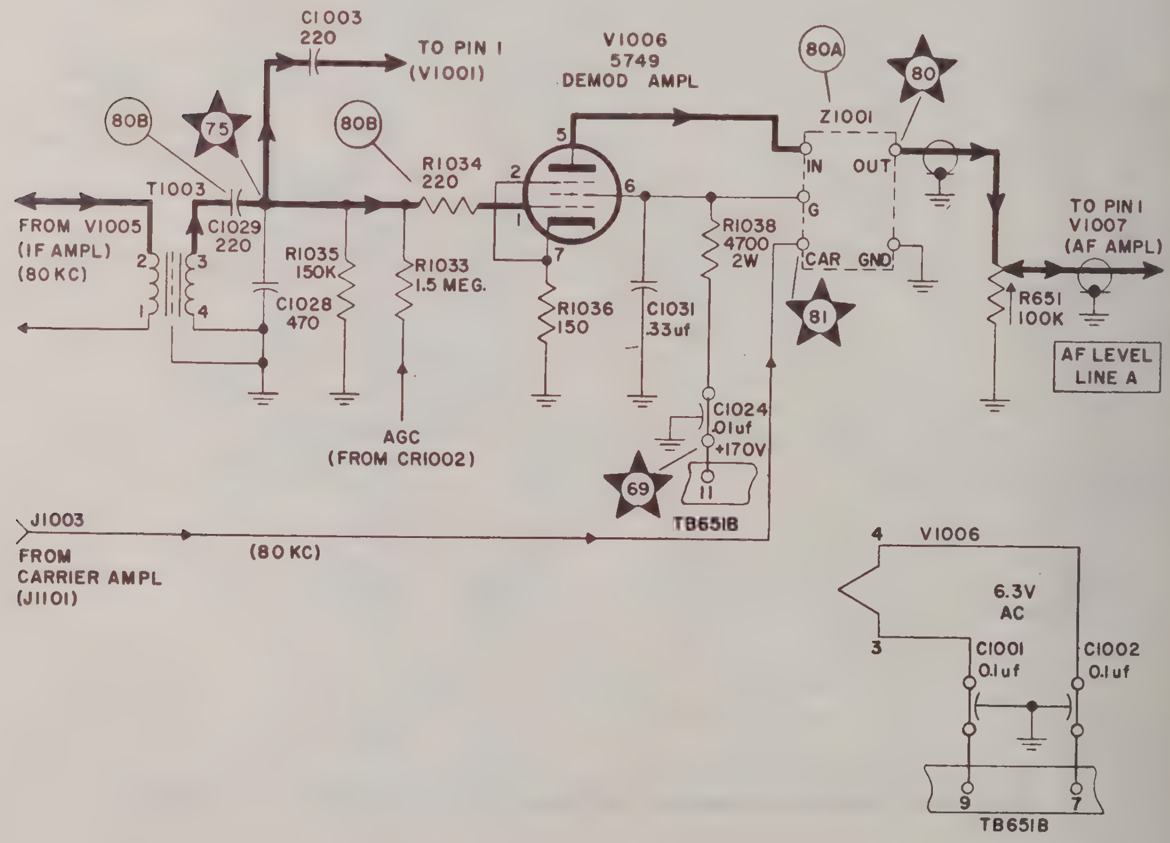

C1003
220
TO PIN 1
(V1001)
V1006
5749
DEMOD AMPL
80A
80
80B
75
80B
Z1001
IN
OUT
G
CAR
GND
T1003
R1034
220
FROM V1005
(IF AMPL)
(80 KC)
C1029
220
R1035
150K
R1033
1.5 MEG.
C1028
470
R1036
150
C1031
.33uf
R1038
4700
2W
81
TO PIN 1
V1007
(AF AMPL)
R651
100K
AF LEVEL
LINE A
AGC
(FROM CR1002)
C1024
.01uf
+170V
69
11
TB651B
J1003
FROM
CARRIER AMPL
(J1101)
(80 KC)
4
V1006
6.3V
AC
3
C1001
0.1uf
C1002
0.1uf
9
7
TB651B

Figure 5-47. USB Detector-Amplifier, Demodulator, Functional Schematic Diagram

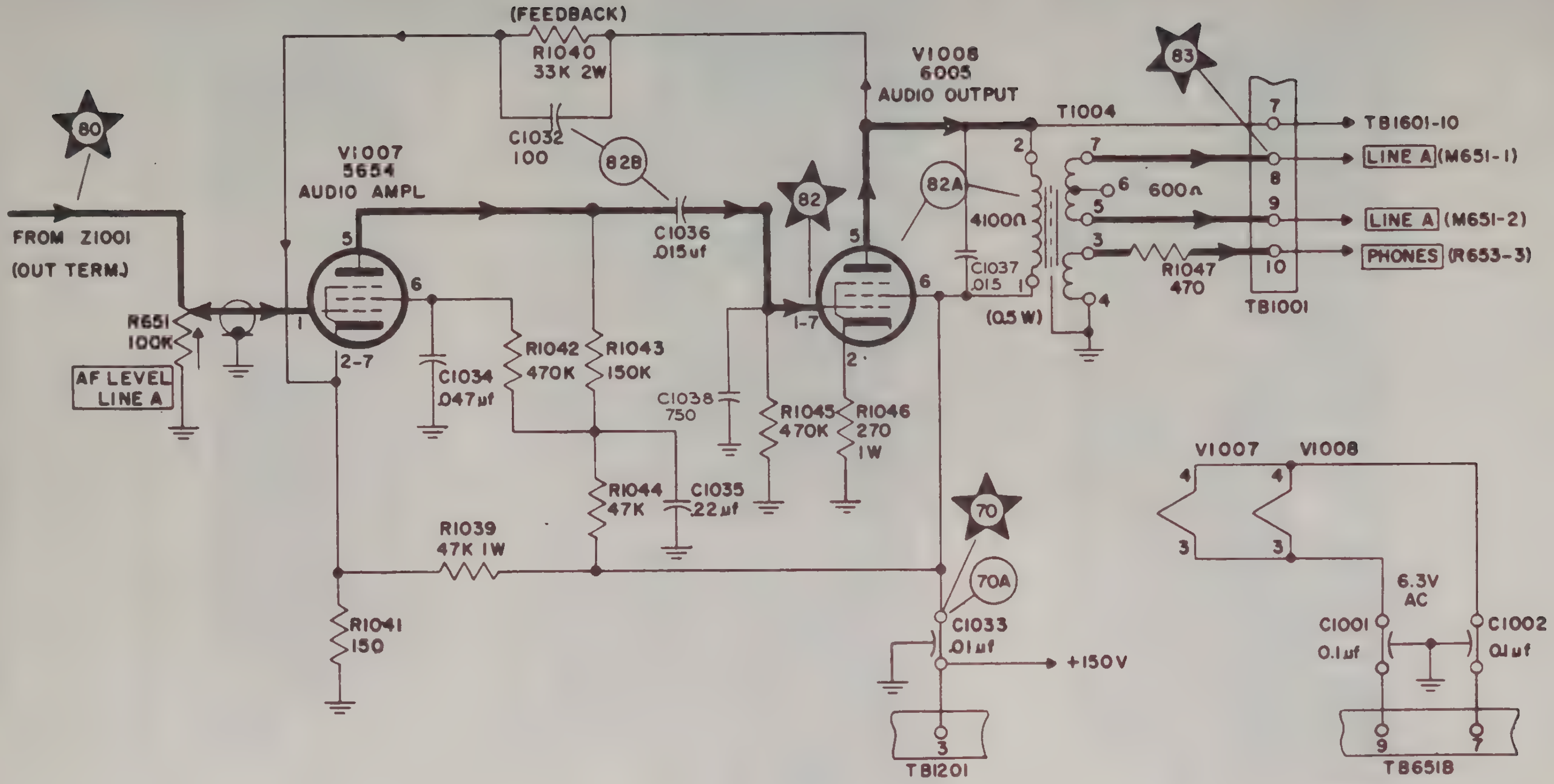

80
FROM Z1001
(OUT TERM.)
R651
100K
AF LEVEL
LINE A
V1007
5654
AUDIO AMPL
5
6
1
2-7
(FEEDBACK)
R1040
33K 2W
C1032
100
82B
C1036
.015uf
C1034
.047µf
R1042
470K
R1043
150K
R1044
47K
C1035
.22µf
R1039
47K 1W
R1041
150
82
C1038
750
R1045
470K
R1046
270
1W
1-7
2
V1008
6005
AUDIO OUTPUT
5
6
82A
4100Ω
C1037
.015
(0.5 W)
T1004
2
1
7
6
5
3
4
600Ω
R1047
470
83
7
8
9
10
TB1001
TB1601-10
LINE A (M651-1)
LINE A (M651-2)
PHONES (R653-3)
70
70A
C1033
.01µf
+150V
3
TB1201
V1007
V1008
4
3
6.3V
AC
C1001
0.1µf
C1002
0.1µf
9
7
TB651B

Figure 5-48. USB Detector-Amplifier, Audio Amplifier, Functional Schematic Diagram

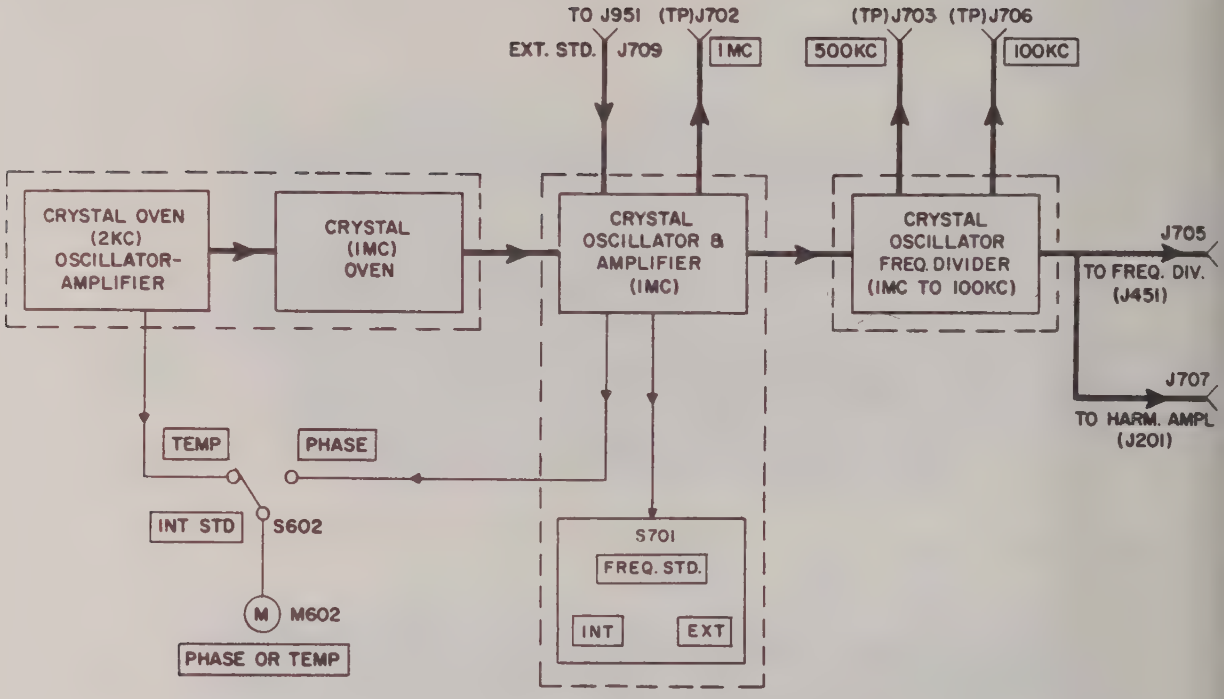

TO J951
EXT. STD.
J709
(TP)J702
1MC
(TP)J703
500KC
(TP)J706
100KC
CRYSTAL OVEN (2KC) OSCILLATOR-AMPLIFIER
CRYSTAL (1MC) OVEN
CRYSTAL OSCILLATOR & AMPLIFIER (1MC)
CRYSTAL OSCILLATOR FREQ. DIVIDER (1MC TO 100KC)
J705
TO FREQ. DIV. (J451)
J707
TO HARM. AMPL (J201)
TEMP
PHASE
INT STD
S602
M
M602
PHASE OR TEMP
S701
FREQ. STD.
INT
EXT

Figure 5-51. Crystal Oscillator, Functional Block Diagram

TABLE 5-13. USB DETECTOR-AMPLIFIER, TROUBLE-SHOOTING CHART

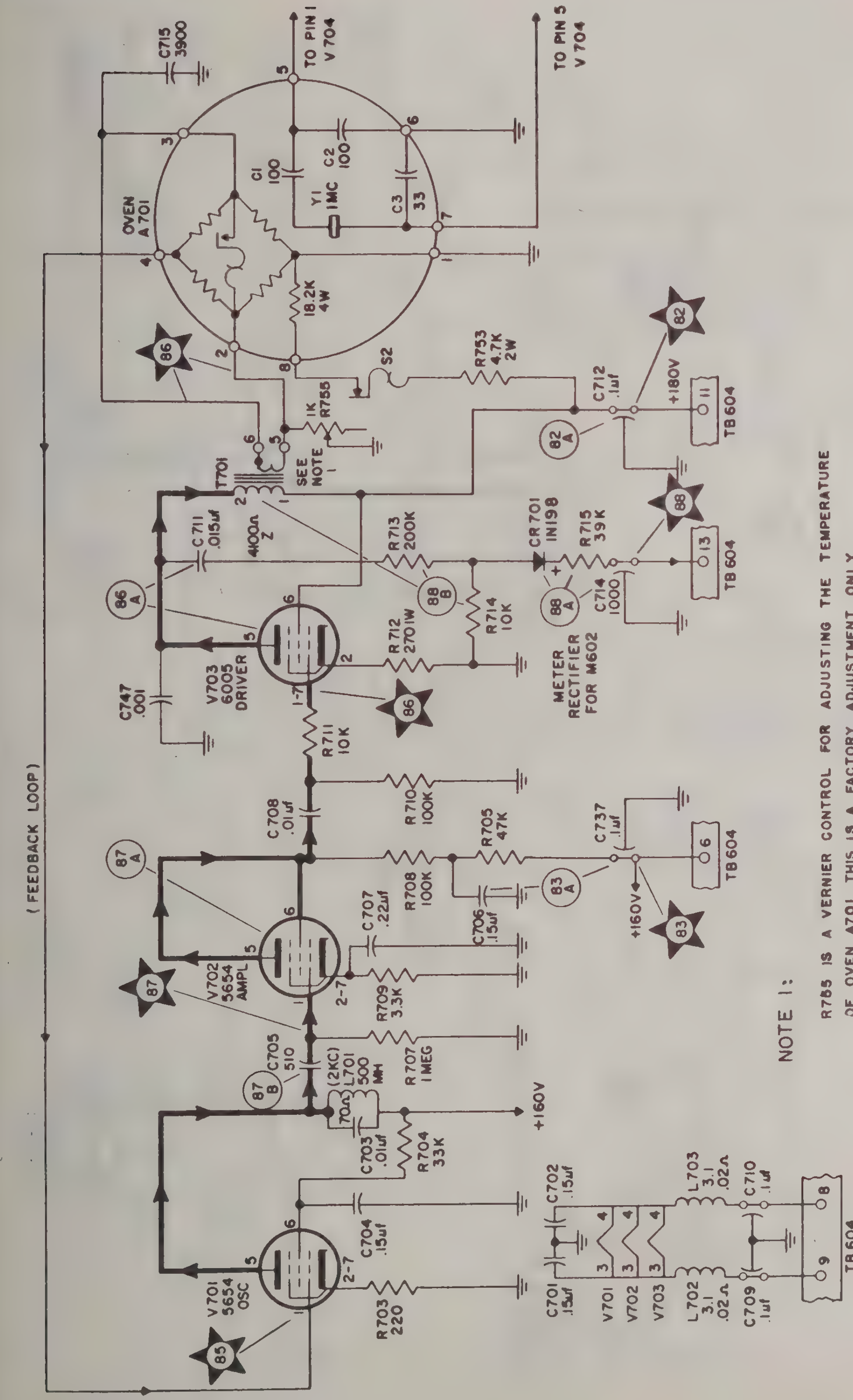
STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	69 69A	Connect multimeter to chassis feed-through capacitors. Select 200 vdc range; tolerance ±20%. NOTE: Place RECEPTION switch in the SSB position for all steps.	C1024: +170 vdc	If indication is abnormal, perform steps in table 5-6. Check C1024. WARNING Turn off power before making ohmmeter measurements.
			C1033: +150 vdc	See above; check C1033.
	71		C1015: 2.5 vdc	If indication is abnormal, check R605 and R606 and RF GAIN control R607A-B.
	Figs. 5-44 to 5-50			

TABLE 5-13. USB DETECTOR-AMPLIFIER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
2	72 73 73A 73B 74 74A 74B 75 Figs. 5-45 5-49 5-50 Table 6-9	Remove plug P1001 from J1001 and connect signal generator to J1001. Adjust for a 79 kc output (60 uv). Set RF GAIN control at fully clockwise position and measure signal at test points with VTVM ME-30/U.	V1004 pin 1: 0.2 mv (minimum)	If indication is abnormal, replace V1003. Check socket pin voltages with table 6-9. Check C1013, T1002, and C1018.
			V1005 pin 1: 1.0 mv (minimum)	If indication is abnormal, replace V1004. Check socket pin voltages. Check C1021, FL1001, R1027, and C1025. (See par. 6-4*d* for GAIN BAL adjustment information.)
			V1006 pin 1: 9.0 mv (minimum)	If indication is abnormal, replace V1005. Check socket pin voltages. Check T1003, C1026, C1028, R1029, and R1031.
3	80 80A 80B Fig. 5-47	With signal generator at J1001 as described in step 2, set the AF LEVEL LINE A control fully clockwise and measure at test points with VTVM.	V1007 pin 1: 60 mv (minimum)	If indication is abnormal, replace V1006. Check socket pin voltages. If still abnormal, perform step 4. Check C1029, R1034, and R651.
4	81 Fig. 5-47	Measure 80 kc carrier signal at Z1001 with VTVM ME-30/U.	Z1001 terminal CAR: 2.5 v rms (approx)	If indication is abnormal, refer to par. 6-7 and test carrier amplifier circuit.

TABLE 5-13. USB DETECTOR-AMPLIFIER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5	82 82A 82B 138 Figs. 5-49 5-50 Table 6-9	With signal generator at J1001 as described in step 2, set AF LEVEL LINE A control fully clockwise and measure at test points with VTVM ME-30/U.	V1008 pins 1 and 7: 1.25 v rms (minimum)	If indication is abnormal, replace V1007. Check socket pin voltages. Check C1036, C1032, and R1040.
			J1802: 1.9 v rms (minimum) LINE A (600 ohm load connected). Refer to figures 5-77 and 5-79.	If indication is abnormal, replace V1008. Check socket pin voltages. Check T1004 and connections at TB1001.
6	77 77A	To test AGC amplifier circuit, place UPPER AGC switch in the ON position. Signal generator still at J1001 as described in step 2.	T1001 terminal 3: 6 v rms (minimum)	If indication is abnormal, replace V1001. Check socket pin voltages. Check T1001, C1004, and R1002.
		Measure the signal at test points with VTVM ME-30/U. Use VTVM ME-6D/U for dc measurements.		
	79 Figs. 5-46 5-49 5-50		Junction CR1002 and C1010: —6 vdc (minimum)	If indication is abnormal, check diode CR1002 and components C1010, R1007, R1033 and R1035.
7	79 79A 79A2 Figs. 5-46 5-49 5-50	To test the AGC voltage doubler circuit (V1002-A), place UPPER AGC switch in the ON position and increase the output of the signal generator to 100 uv and note increase in AGC voltage at the junction of CR-1002 and C1010.	Junction CR1002 and C1010: —8 vdc (minimum)	If indication is abnormal, replace V1002. Check socket pin voltages.


C715
3900
TO PIN 1
V704
TO PIN 5
V704
OVEN
A701
C1
100
C2
100
Y1
1MC
C3
33
18.2K
4W
R753
4.7K
2W
S2
1K
R755
SEE
NOTE
1
T701
C712
.1uf
+180V
TB604
11
82
82
A
86
86
A
86
C711
.015uf
4400Ω
Z
R713
200K
CR701
1N198
R715
39K
88
88
A
88
B
C714
1000
13
METER
RECTIFIER
FOR M602
V703
6005
DRIVER
R712
270 1W
R714
10K
C747
.001
R711
10K
(FEEDBACK LOOP)
C708
.01uf
R710
100K
87
87
A
87
B
R705
47K
C737
.1uf
6
R708
100K
C707
.22uf
C706
.15uf
83
83
A
+160V
V702
5654
AMPL
R709
3.3K
C705
510
(2KC)
L701
500
MH
70Ω
R707
1 MEG
+160V
C703
.01uf
R704
33K
V701
5654
OSC
C704
.15uf
C702
.15uf
R703
220
85
C701
.15uf
V701
V702
V703
L702
3.1
.02Ω
L703
3.1
.02Ω
C709
.1uf
C710
.1uf
9
8
TB604
(6.3 V AC)

NOTE 1:

R755 IS A VERNIER CONTROL FOR ADJUSTING THE TEMPERATURE OF OVEN A701. THIS IS A FACTORY ADJUSTMENT ONLY.

Figure 5-52. *Crystal Oscillator, Oven Oscillator-Amplifier, Functional Schematic Diagram*

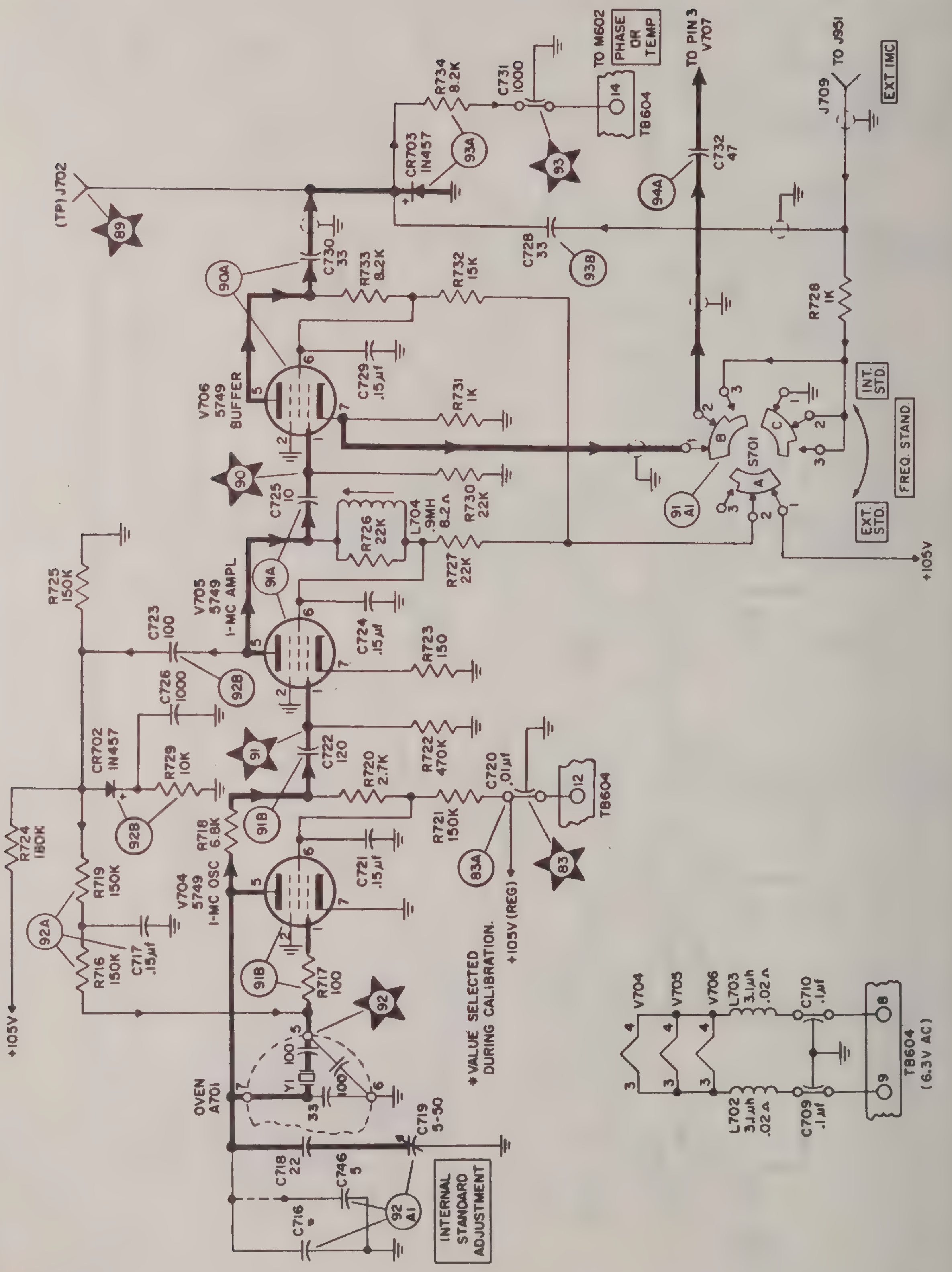
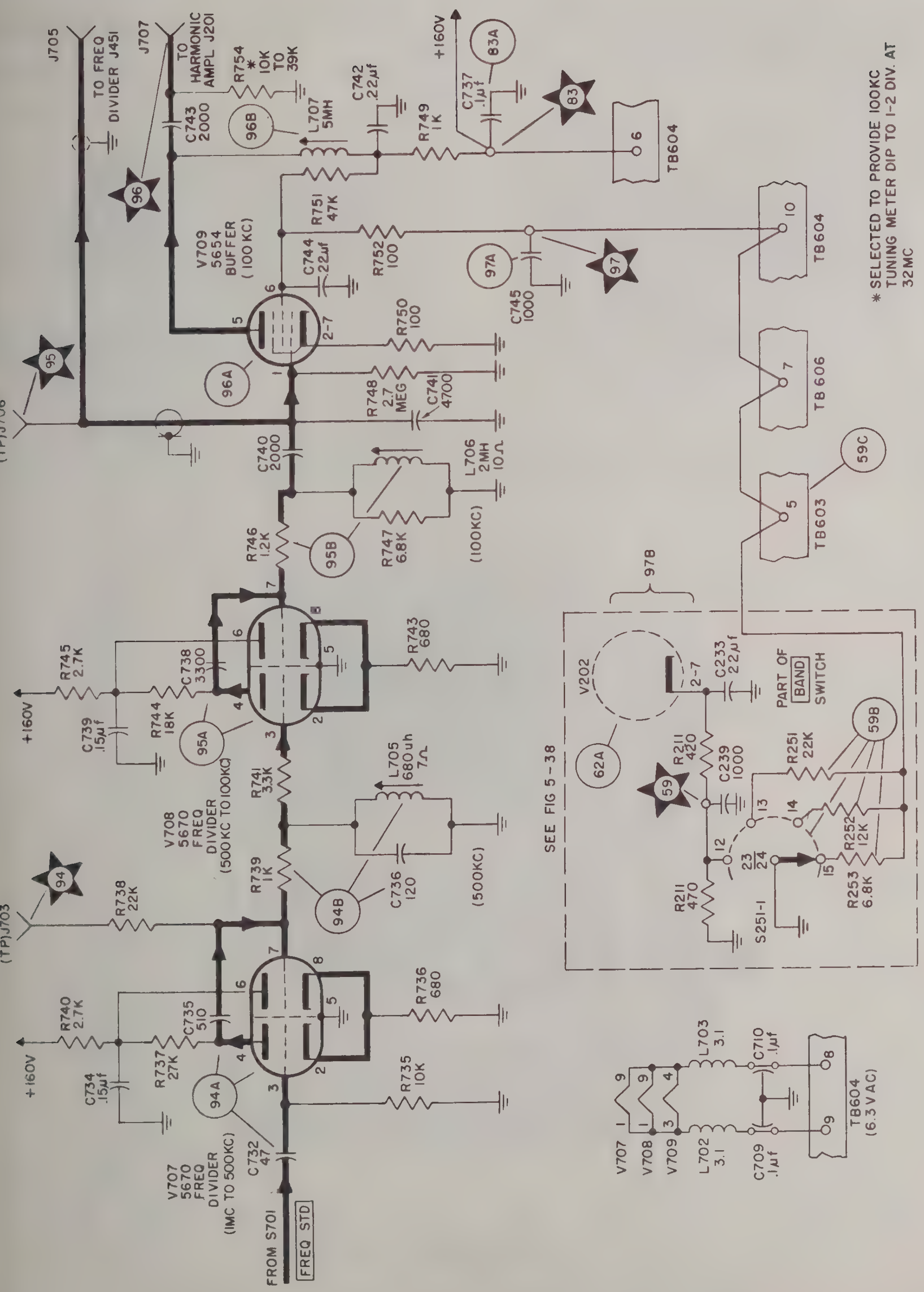

(TP) J702
89
V706
5749
BUFFER
C730
33
R733
8.2K
R732
15K
C728
33
93B
90A
C729
.15µf
R731
1K
R734
8.2K
C731
1000
CR703
1N457
93A
93
TO M602
PHASE
OR
TEMP
14
TB604
TO PIN 3
V707
C732
47
94A
TO J951
J709
EXT IMC
R728
1K
INT.
STD.
FREQ. STAND.
EXT.
STD.
S701
91
A1
+105V
90
C725
10
R726
22K
L704
.9MH
8.2Ω
R730
22K
R727
22K
91A
V705
5749
1-MC AMPL
C724
.15µf
R723
150
R725
150K
C723
100
92B
C726
1000
CR702
1N457
R729
10K
91
C722
120
R720
2.7K
R722
470K
R721
150K
C720
.01µf
12
TB604
83A
83
+105V (REG)
R718
6.8K
91B
V704
5749
1-MC OSC
C721
.15µf
R724
180K
R719
150K
92A
R716
150K
C717
.15µf
+105V
91B
R717
100
92
*VALUE SELECTED
DURING CALIBRATION.
OVEN
A701
Y1
100
33
100
C719
5-50
C718
22
C746
5
C716
*
92
A1
INTERNAL
STANDARD
ADJUSTMENT
V704
V705
V706
L703
3.1µh
.02Ω
C710
.1µf
8
9
TB604
(6.3V AC)
L702
3.1µh
.02Ω
C709
.1µf

Figure 5-53. Crystal Oscillator, Crystal Oscillator-Amplifier, Functional Schematic Diagram


FROM S701
FREQ STD
C732
47
V707
5670
FREQ
DIVIDER
(1MC TO 500KC)
94A
C734
.15µf
+160V
R740
2.7K
R737
27K
C735
510
R735
10K
R736
680
(TP)J703
94
R738
22K
R739
1K
94B
C736
120
(500KC)
V708
5670
FREQ
DIVIDER
(500KC TO 100KC)
R741
3.3K
L705
680uh
7Ω
95A
C739
.15µf
+160V
R745
2.7K
R744
18K
C738
3300
R743
680
R746
1.2K
95B
R747
6.8K
(100KC)
L706
2MH
10Ω
C740
2000
(TP)J706
95
R748
2.7
MEG
C741
4700
96A
V709
5654
BUFFER
(100KC)
R750
100
C744
.22µf
R752
100
R751
47K
96
C743
2000
96B
L707
5MH
R754
*
10K
TO
39K
J705
TO FREQ
DIVIDER J451
J707
TO
HARMONIC
AMPL J201
C742
.22µf
R749
1K
C737
.1µf
83A
+160V
83
TB604
6
97A
C745
1000
97
10
TB604
7
TB 606
5
TB603
59C
97B
SEE FIG 5-38
62A
V202
2-7
C233
.22µf
PART OF
BAND
SWITCH
59
R211
420
C239
1000
R251
22K
59B
13
14
12
23
24
15
R252
12K
R253
6.8K
R211
470
S251-1
V707
V708
V709
9
1
9
1
4
3
L703
3.1
L702
3.1
C710
.1µf
C709
.1µf
8
9
TB604
(6.3 VAC)
1
2
3
4
5
6
7
8

* SELECTED TO PROVIDE 100KC TUNING METER DIP TO 1-2 DIV. AT 32MC

Figure 5-54. Crystal Oscillator, Frequency Divider, Functional Schematic Diagram

b. ACCESS.—The crystal oscillator subassembly is located in the upper converter deck. For access to the top, simply open the converter drawer; for access to the bottom, raise the upper deck. Figure 5-55 shows the location of parts.

Opening the converter drawer breaks the signal circuits by parting the connection at the rear of the drawer. To restore them, raise the converter drawer to its 90° index position and connect patch cable W624 between connectors P601, at the rear of the converter drawer, and J951, on the converter blister. Plate and filaments supply voltages are not affected by opening the drawer.

WARNING

Potentials up to 210 volts rms are present in the power-supply circuits. Avoid contact.

c. PRELIMINARY CHECK.—Before trouble-shooting the crystal oscillator subassembly, check the following with the power off.

(1) Seating of tubes V701 through V709 in the sockets

(2) Cable connections at J705, J707, J708, an J709

(3) All soldered connections at feed-through te minals

(4) Mechanical operation of FREQ. STANDAR and TUNING controls.

d. TEST EQUIPMENT AND SPECIAL TOOLS. Use Multimeter AN/PSM-4B, VTVM ME-30/U an ME-6D/U, and Oscilloscope OS-8C/U, or their equiva lents. Special tools are not required.

e. CONTROL SETTING.—Set the controls to th positions shown in table 5-2. Exceptions are given i the steps involved. Place POWER switch to the O position and allow at least 30 seconds for warm-up.

f. CRYSTAL OSCILLATOR TROUBLE-SHOOT ING CHART.—Table 5-14 is a trouble-shooting char for the crystal oscillator. It includes initial measure ments of power-supply voltages and stage-by-stage signa

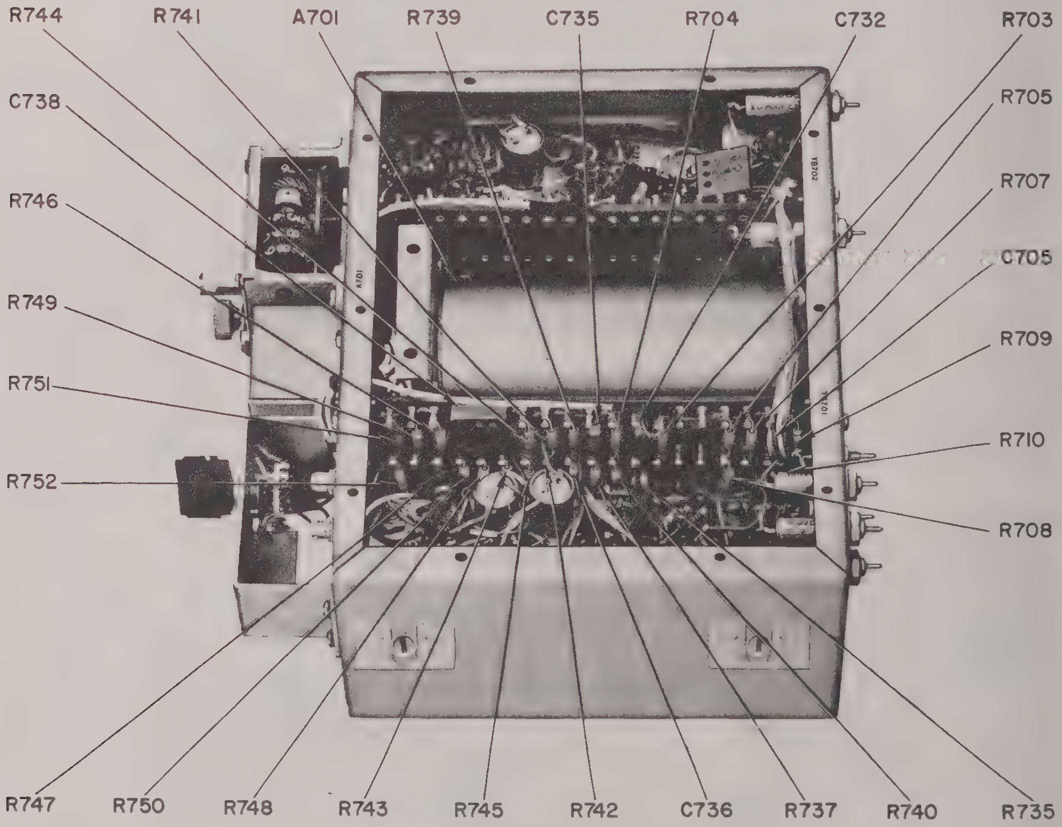


Figure 5-55. Crystal Oscillator, Location of Parts (Sheet 1 of 3)

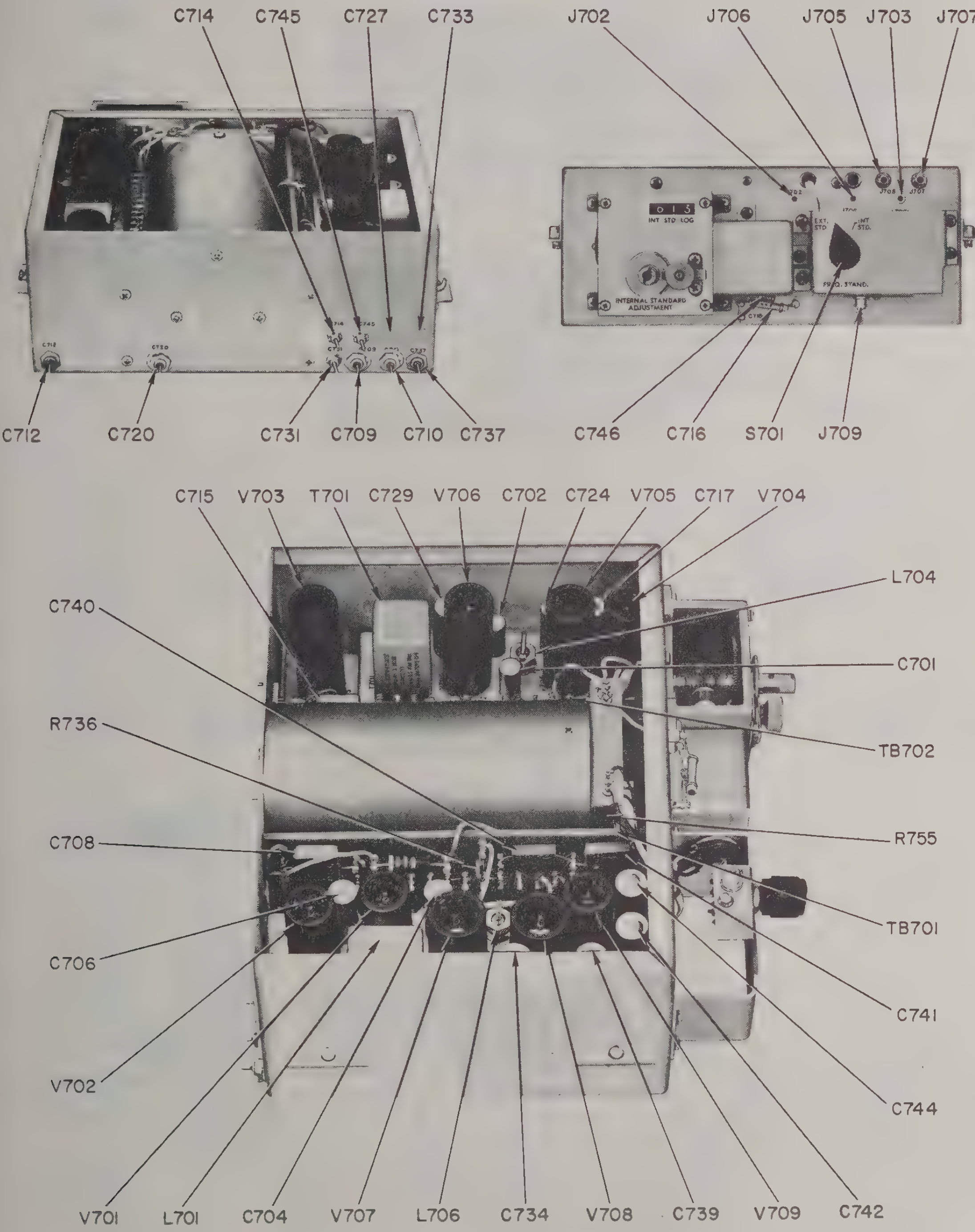

C714
C745
C727
C733
C712
C720
C731
C709
C710
C737
J702
J706
J705
J703
J707
0 1 3
INT STD LOG
INTERNAL STANDARD ADJUSTMENT
EXT. STD
INT STD.
FREQ. STAND.
C746
C716
S701
J709
C715
V703
T701
C729
V706
C702
C724
V705
C717
V704
L704
C740
C701
TB702
R736
R755
C708
TB701
C706
C741
V702
C744
V701
L701
C704
V707
L706
C734
V708
C739
V709
C742

Figure 5-55. Crystal Oscillator, Location of Parts (Sheet 2 of 3)

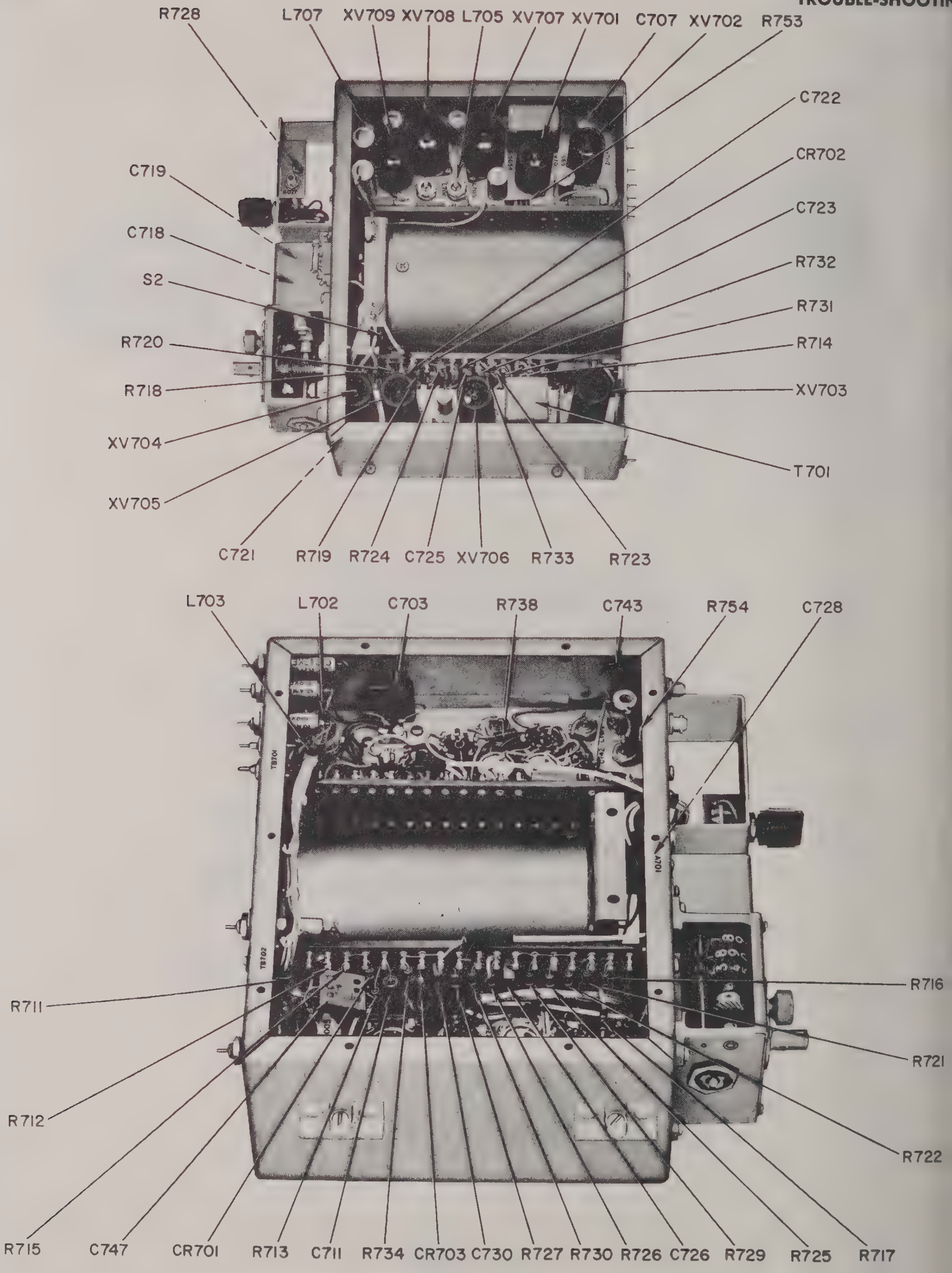

R728
L707
XV709
XV708
L705
XV707
XV701
C707
XV702
R753
C722
CR702
C723
R732
R731
R714
XV703
T701
C719
C718
S2
R720
R718
XV704
XV705
C721
R719
R724
C725
XV706
R733
R723
L703
L702
C703
R738
C743
R754
C728
R716
R721
R722
R711
R712
R715
C747
CR701
R713
C711
R734
CR703
C730
R727
R730
R726
C726
R729
R725
R717

Figure 5-55. Crystal Oscillator, Location of Parts
(Sheet 3 of 3)

TABLE 5-14. CRYSTAL OSCILLATOR, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	82 82A 83 Figs. 5-51 to 5-56	Connect multimeter between chassis and feed-through capacitors. Select 200 vdc range tolerance ±20%.	C712: +175 vdc	If indication is abnormal, perform steps in table 5-5. Check C712. WARNING Turn off power before making ohmmeter measurements.
			C737: +160 vdc	See above; check C706, C734, C737, C739 and C742.
			C720: +105 vdc ±10% tol.	See above; check C720.
2	85 Figs. 5-52 5-55 5-56	Measure 2 kc (approx) oven amplifier feedback signal. Value is high with cold oven and decreases during first hour of operation. Use VTVM.	V701 pin 1: 1.5 to 2.0 vac (cold)	If indication is abnormal, perform step 3; if normal, proceed to step 5. (Normal oven operation is indicated also by a half scale reading on the PHASE OR TEMP. meter with INT. STD. switch in the TEMP. position.)
			V701 pin 1: .005 to .01 vac (hot)	
3	86 86B Fig. 5-52 Table 6-7 87	Measure oven heater voltage at T701 with VTVM ME-30/U.	T701 terminal 6: 6 to 7 vac (cold)	If indication is abnormal, check V701, V702, and V703. Check socket pin voltages. Check T701, C708, and C705.
			T701 terminal 5: 8 to 9 vac (cold)	
4	88 88A 88B Figs. 5-52 5-55 5-56	If PHASE or TEMP. meter M602 does not indicate and oven operation is normal, measure meter operating voltage at feed-through capacitor C714 with multimeter. Place switch S602 in the TEMP. position.	C714: .125 vdc (approx for one-half scale meter reading)	If indication is abnormal, check CR701, C711, R713, R714, R715, and C714. If normal but meter M602 does not indicate, replace meter; check switch S602.

TABLE 5-14. CRYSTAL OSCILLATOR, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5	★89 ★90 ★91 ★92 Figs. 5-53 5-55 5-56 Table 6-7	Measure 1 mc signal at TP J702 with VTVM ME-30/U. Place FREQ. STAND. switch S701 to the INT. position.	TP J702: .3 to .7 vac	If indication is abnormal, check V704, V705, and V706. Check socket pin voltages. Check for signal at pin 1 of each tube. Check CR702 and feedback network.
6	★94 94A 91A Figs. 5-54 5-55 5-56 Table 6-7	Measure 500 kc signal at TF J703 with VTVM ME-30/U. (Test point is located on panel.) Connect Y axis of oscilloscope to TP J703, X axis to TP J702. Note Lissajou pattern. NOTE: FREQ. STAND. switch S701 must be in INT. position for this test.	TP J703: .3 to .7 vac Lissajou: 2 to 1 ratio	If indication is abnormal, replace V707. Check socket pin voltages. Check R732, C735, and S701. If Lissajou pattern is wrong, refer to crystal oscillator alignment instructions in Section 6.
7	★95 95A 95B Fig. 5-54	Measure 100 kc signal at TP J706 with VTVM ME-30/U. Connect Y axis of oscilloscope to TP J706, X axis to TP J703. Note Lissajou pattern. (Remove cable W615 at J705.)	TP J706: 1.4 to 1.7 vac Lissajou: 5 to 1 ratio	If indication is abnormal, replace V708. Check socket pin voltages. Refer to Section 6 for crystal oscillator alignment instructions.
8	★96 96A 96B Fig. 5-54	Measure 100 kc signal at connector J707 with VTVM ME-30/U. (Remove cable W622 from J707.)	J707: 25 ~~to 30 vac~~ 10 VAC, OR MORE, MEASURED	If indication is abnormal, replace V709. Check socket pin voltages. Check C743, C740, and C741. Refer to Section 6 for crystal oscillator alignment instructions.

TABLE 5-14. CRYSTAL OSCILLATOR, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
9	☆97 97A 97B Figs. 5-54 5-39	If step 8 tests are still abnormal, measure V709 screen supply voltage at feed-through capacitor C745 with VTVM. Select dc range. Note voltage reading for each position of the BAND switch.	C745: 20 vdc (approx) on BAND 1, increasing progressively to 60 vdc (approx) on BAND 4 ±20% tol.	If indication is abnormal, refer to table 5-11 and check resistors selected by switch section S251-1 (in the harmonic amplifier circuit).
10	☆93 93A Figs. 5-53 5-55 5-56	To test the PHASE or TEMP. meter circuit with switch S602 in the PHASE position, measure meter operating voltage at feed-through capacitor C731 with VTVM. Select dc range. (FREQ. STAND. switch must be in the INT. position for this test. An external signal at J709 is not required.)	C731: .08 to .1 vdc for approximately one-third scale meter indication.	If indication is abnormal, check CR703, R734, and C731. If normal but meter does not indicate, replace meter and check switch S602. NOTE: Replace all interconnecting cables that were removed in the previous steps.
11	92A1 Figs. 5-53 5-55 5-56 3-1	When checking the frequency of the crystal oscillator with a primary frequency standard, if an adjustment cannot be made because the INT. STD. LOG reads 000, connect C746 in parallel with C716 by adding a short jumper. (These capacitors are located on the crystal oscillator subassembly.)	Frequency correction of the crystal oscillator can be made by adjusting the INTERNAL STANDARD ADJUSTMENT control. INT. STD. LOG reads between 600 and 900.	NOTE: This step is usually required only after appreciable equipment service and is intended to compensate for normal aging of the 1 mc crystal in oven assembly A701.

tracing. Perform the steps in the order shown. Compare the result of each step with the information in the NORMAL INDICATION column and follow the instructions given in the NEXT STEP column. Figure 5-56 shows the location of test points, and table 6-7 provides voltage and resistance measurements for tube sockets in the subassembly.

5-19. FREQUENCY DIVIDER.

(See figure 5-57.)

a. FUNCTION.—The frequency divider further divides the 100 kc output signal of the crystal oscillator to 20 kc for operation of the synthesizer circuits. Faulty operation of the frequency divider can disable the receiver by preventing or hindering synthesizer production of the 80 kc carrier insertion signal, the 1 kc incremental pips or formation of the 80 kc third conversion frequency.

b. ACCESS.—The frequency divider is located in the lower converter deck. Figure 5-58 shows the location of parts.

c. PRELIMINARY CHECK.—Before trouble-shooting the frequency divider, first inspect the following with the power off:

(1) Seating of tubes V451, V452, and V453 in their sockets

(2) Cable connections at J451 and J455

(3) Soldered connections at chassis feed-through terminals.

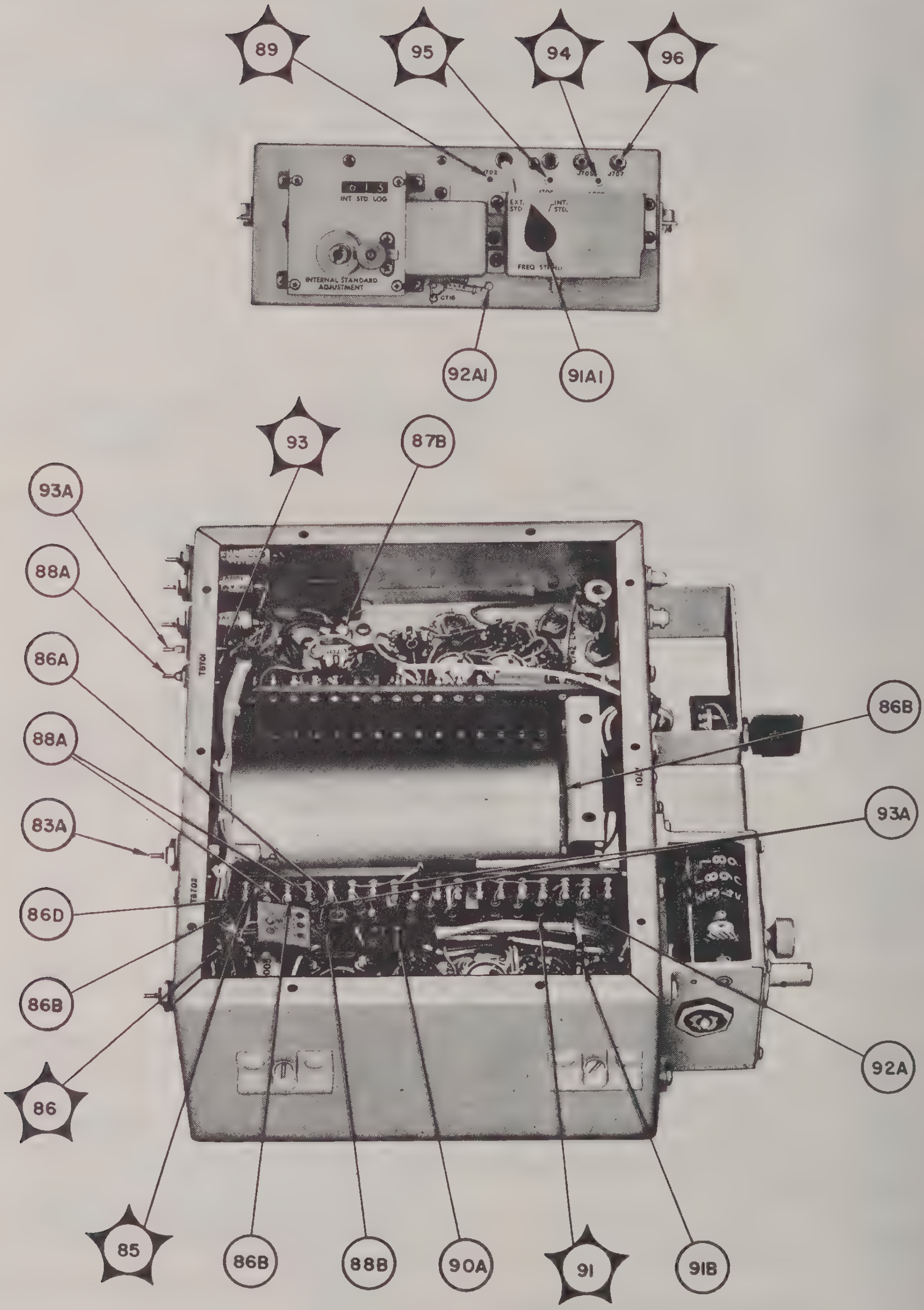

89
95
94
96
J702
J706
J707
INT STD LOG
EXT. STD
INT. STD.
INTERNAL STANDARD ADJUSTMENT
FREQ STAND
C716
92A1
91A1
93
87B
93A
88A
86A
88A
83A
86D
86B
86
TB701
TB702
86B
93A
92A
85
86B
88B
90A
91
91B

Figure 5-56. Crystal Oscillator, Location of Test Points
(Sheet 1 of 3)

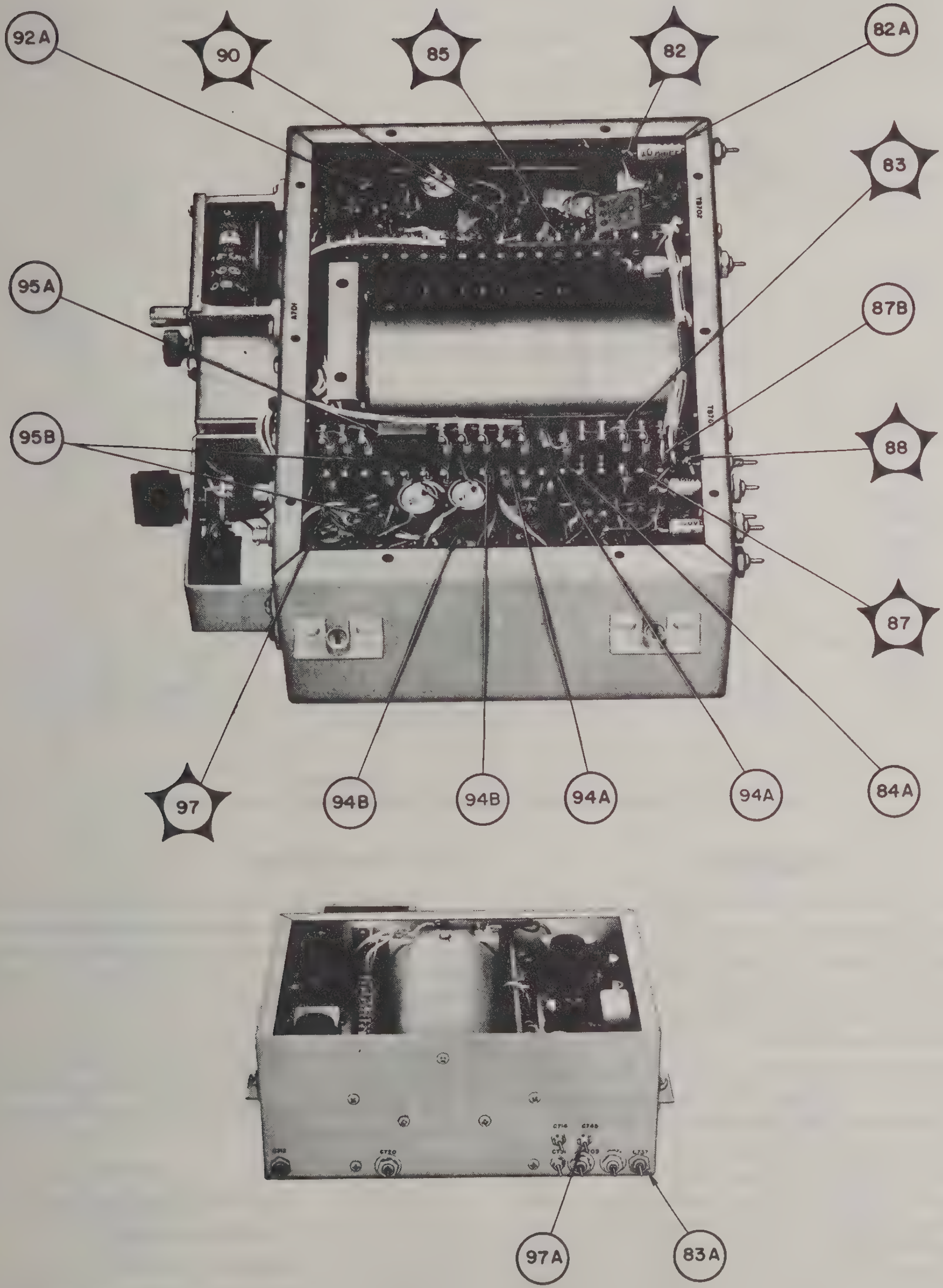

92A
90
85
82
82A
83
95A
87B
95B
88
87
97
94B
94B
94A
94A
84A
97A
83A

Figure 5-56. Crystal Oscillator, Location of Test Points
(Sheet 2 of 3)

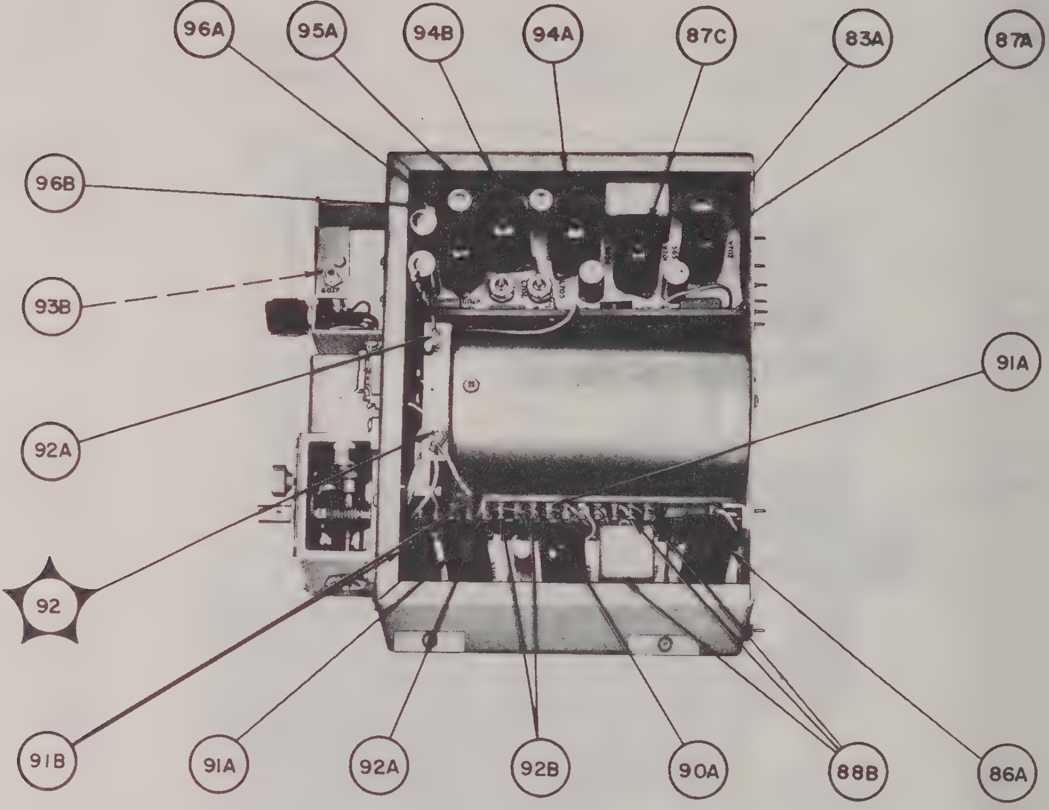


Figure 5-56. Crystal Oscillator, Location of Test Points (Sheet 3 of 3)

WARNING

Potential as high as 210 volts rms are present in the power supply circuit. Avoid contact.

d. TEST EQUIPMENT AND SPECIAL TOOLS.—Use Multimeter AN/PSM-4B, VTVM ME-30/U, Signal Generator AN/URM-25D and Oscilloscope OS-8C/U. Special tools are not required.

e. CONTROL SETTINGS.—Preset all panel controls as shown in table 5-2. Place POWER switch to the ON position and allow at least 30 seconds for warm-up.

f. FREQUENCY DIVIDER TROUBLE-SHOOTING CHART.—Table 5-15 lists the steps for trouble-shooting the frequency divider. Perform them in the order given. Figure 5-57 is the functional schematic diagram of the frequency divider, and figure 5-59 shows the location of test points. Table 5-66 gives voltage and resistance values at the socket pins of tubes V451, V452, and V453. To reach these, take the frequency divider subassembly out of the drawer and remove the cover plate from the bottom. Refer to Section 6 for removal instructions.

5-20. SYNTHESIZER.

a. FUNCTION.—The synthesizer provides an 80 kc signal to the upper- and lower-sideband detector- amplifiers for carrier injection, a 1 kc pip spectrum for incremental tuning, and a 140 kc signal for continuous tuning. Failure to supply any of these can disable the receiver.

b. DIAGRAMS.—For a complete schematic diagram of the synthesizer subassembly, refer to figure 6-17. This paragraph contains the following diagrams related to the synthesizer:

Figure	*Circuit*
5-60	Functional block diagram
5-61	Harmonic generator
5-62	Frequency divider
5-63	Pulse shaper-blocking oscillator
5-64	Injection mixer-amplifier

c. ACCESS.—The synthesizer is located in the upper converter deck. To restore signal circuits broken by the

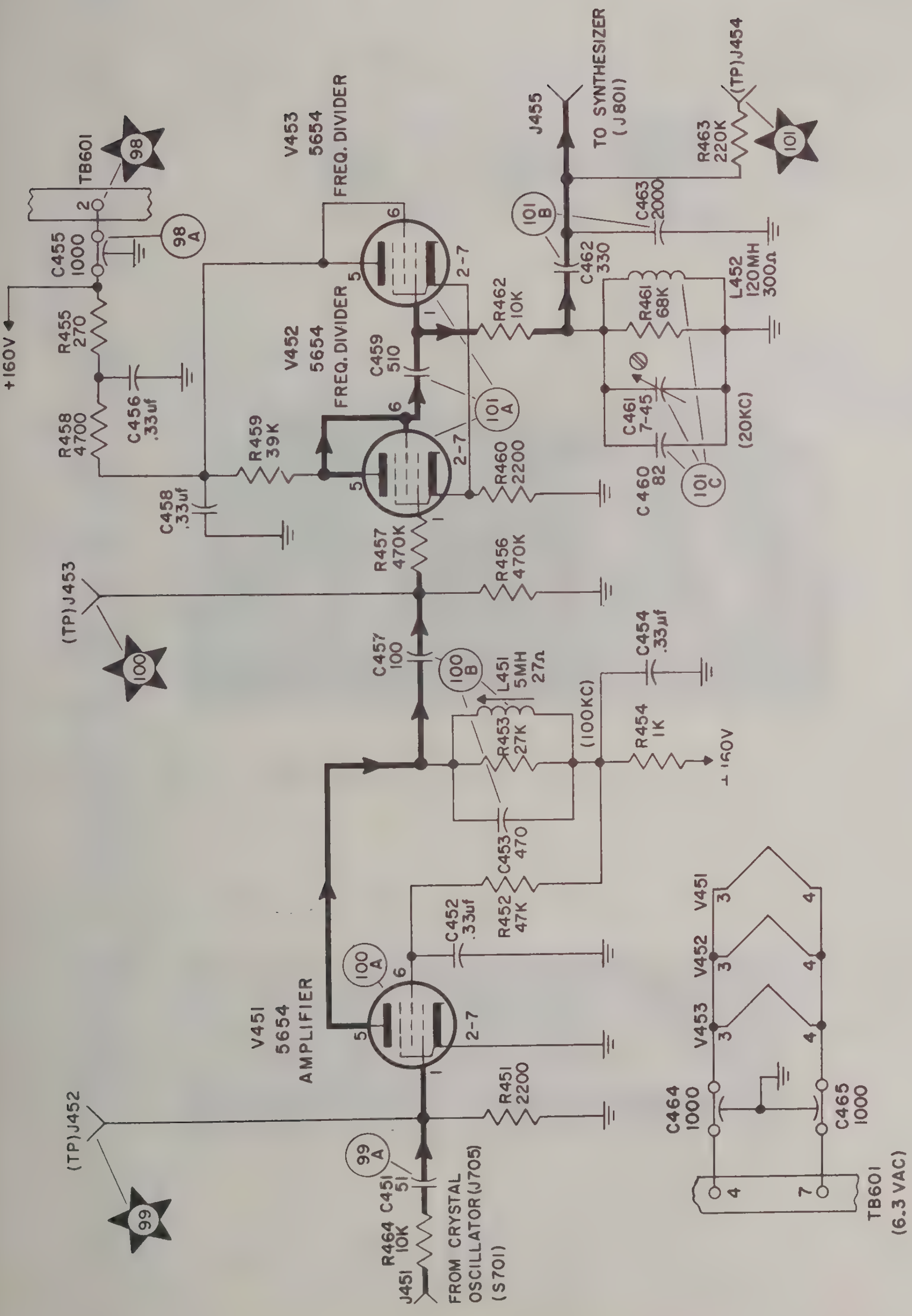

J451
FROM CRYSTAL OSCILLATOR (J705) (S701)
R464 10K
C451 51
99 A
(TP) J452
99
R451 2200
V451 5654 AMPLIFIER
100 A
5
6
2-7
1
C452 .33uf
R452 47K
C453 470
R453 27K
L451 5MH 27Ω
100 B
(100KC)
R454 1K
+160V
C454 .33μf
C457 100
(TP) J453
100
R456 470K
R457 470K
C458 .33uf
R458 4700
C456 .33uf
R455 270
+160V
C455 1000
TB601
2
98
98 A
R459 39K
V452 5654 FREQ. DIVIDER
R460 2200
C459 510
101 A
V453 5654 FREQ. DIVIDER
R462 10K
C460 82
101 C
C461 7-45
(20KC)
R461 68K
L452 120MH 300Ω
C462 330
101 B
C463 2000
J455
TO SYNTHESIZER (J801)
R463 220K
(TP) J454
101
C464 1000
C465 1000
V453
V452
V451
3
4
7
TB601 (6.3 VAC)

Figure 5-57. Frequency Divider, Functional Schematic Diagram

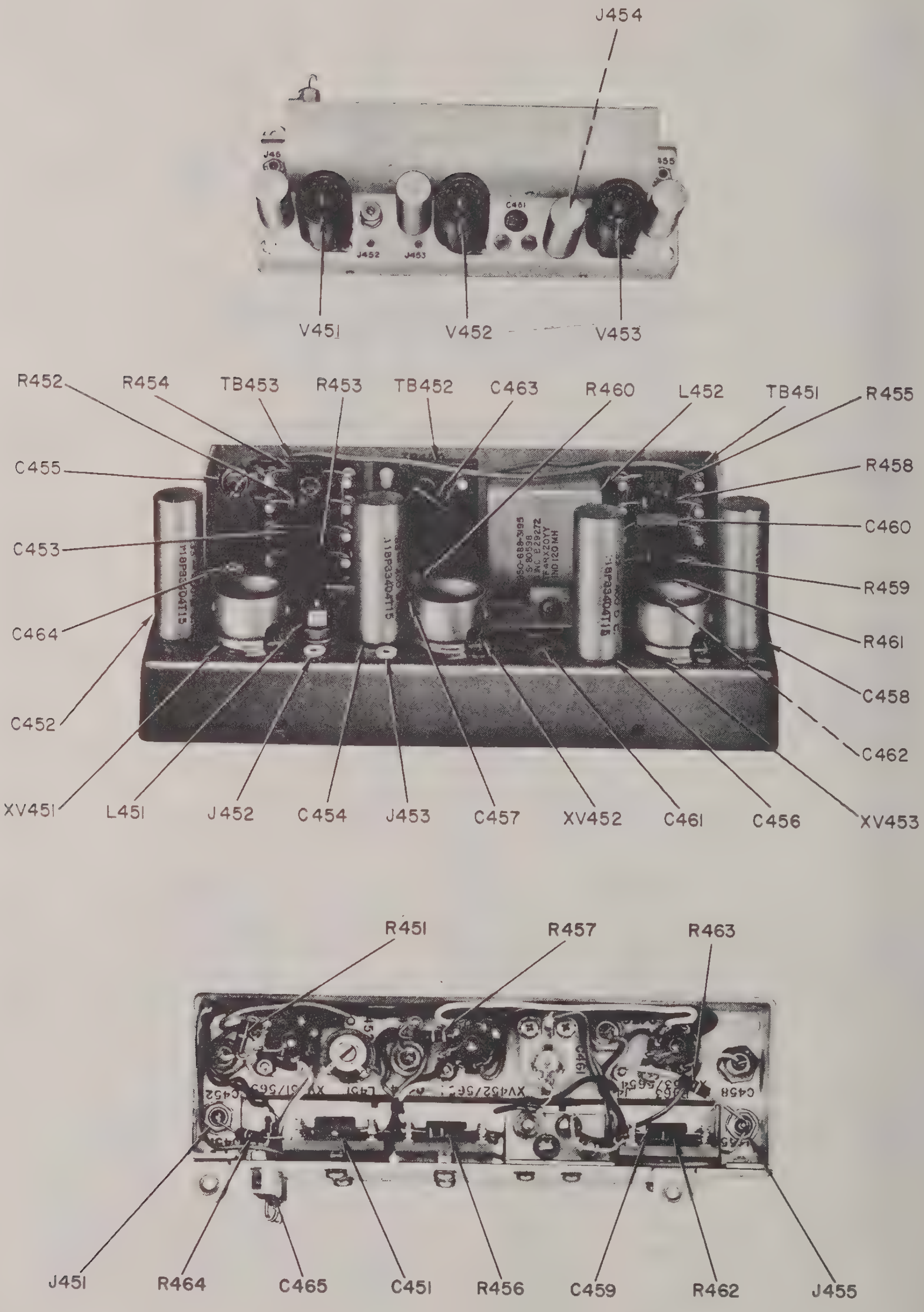

J454
V451
V452
V453
R452
R454
TB453
R453
TB452
C463
R460
L452
TB451
R455
C455
R458
C453
C460
R459
C464
R461
C458
C452
C462
XV451
L451
J452
C454
J453
C457
XV452
C461
C456
XV453
R451
R457
R463
J451
R464
C465
C451
R456
C459
R462
J455

Figure 5-58. Frequency Divider, Location of Parts

TABLE 5-15. FREQUENCY DIVIDER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	98 98A Figs. 5-57 5-58 5-59	Connect the multimeter between the chassis and feed-through capacitor C455. Select the 200 v range. Tolerance ±20%.	C455: +160 vdc	If indication is abnormal, refer to table 5-5. Check C454, C455, C456, and C458. WARNING Turn off power before making ohmmeter measurements.
2	99 100 99A 100A 100B Figs. 5-57 5-58 5-59 Table 6-6	Disconnect plugs P451 and P455 from J451 and J455. Connect signal generator to J451 and adjust for a 100 kc 1.0 vac output. Measure signal at TP J453 with VTVM. Connect Y axis of oscilloscope to TP J453, X axis to TP J452 and note Lissajou pattern.	TP J453: 2.7 to 3.2 vac Lissajou: 1 to 1 ratio	If indication is abnormal, replace V451. Check socket pin voltages. Check C451 and C457. Refer to section 6 for frequency divider alignment instructions.
3	101 101A to 101C Figs. 5-57 5-58 5-59 Table 6-6	With signal generator at J451 and adjusted as in step 2, measure signal at TP J454 with VTVM. Connect Y axis of oscilloscope to TP J454, X axis to TP J452. Note Lissajou pattern.	TP J454: 1.3 to 1.7 vac Lissajou: 5 to 1 ratio	If indication is abnormal, check V452 and V453. Check socket pin voltages. Check C459, C462, and C463. Refer to Section 6 for frequency divider alignment instructions.

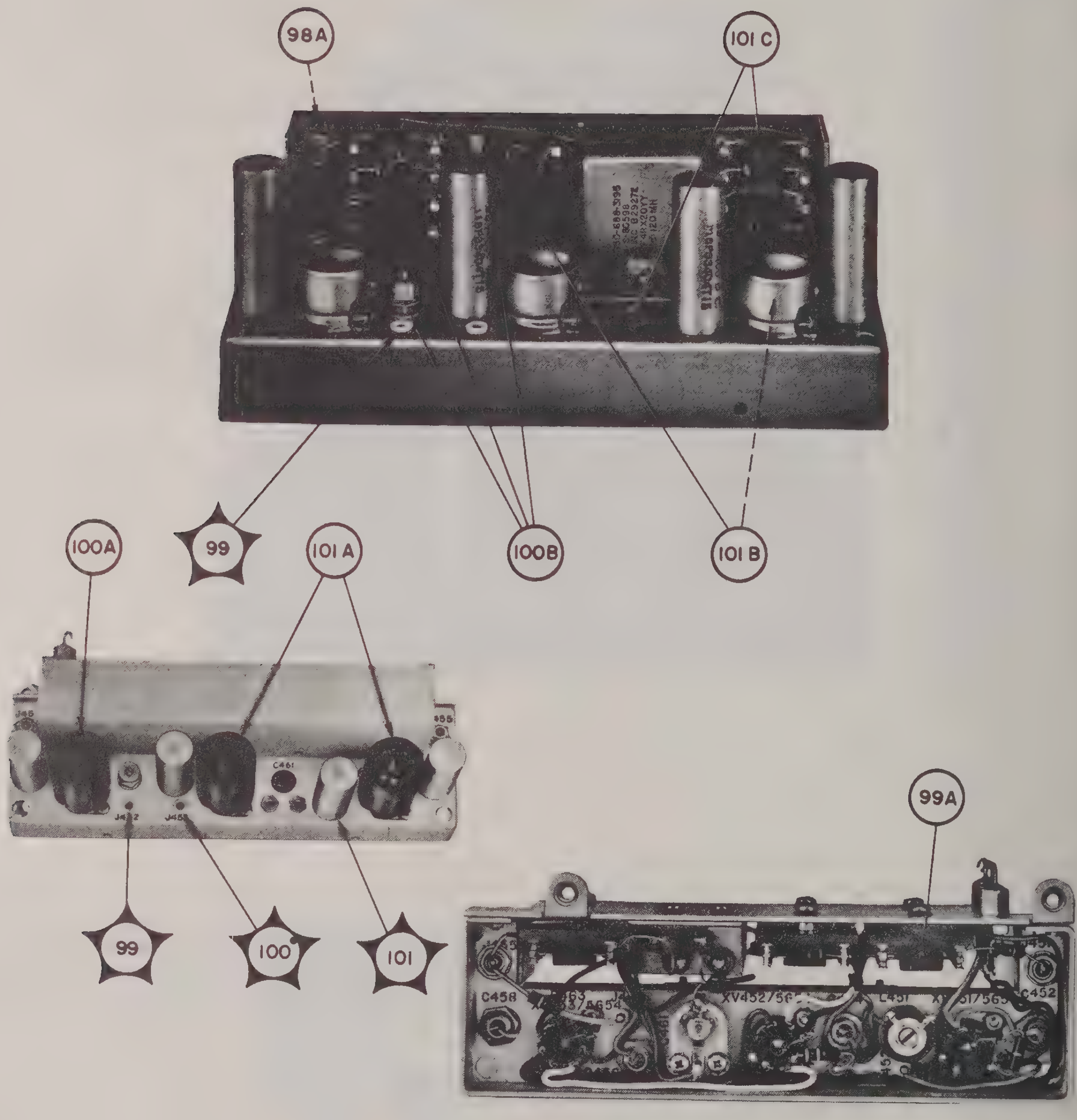

98A
101 C
100A
99
101 A
100B
101 B
99A
99
100
101
C461
C458
C452
L451

Figure 5-59. Frequency Divider, Location of Test Points

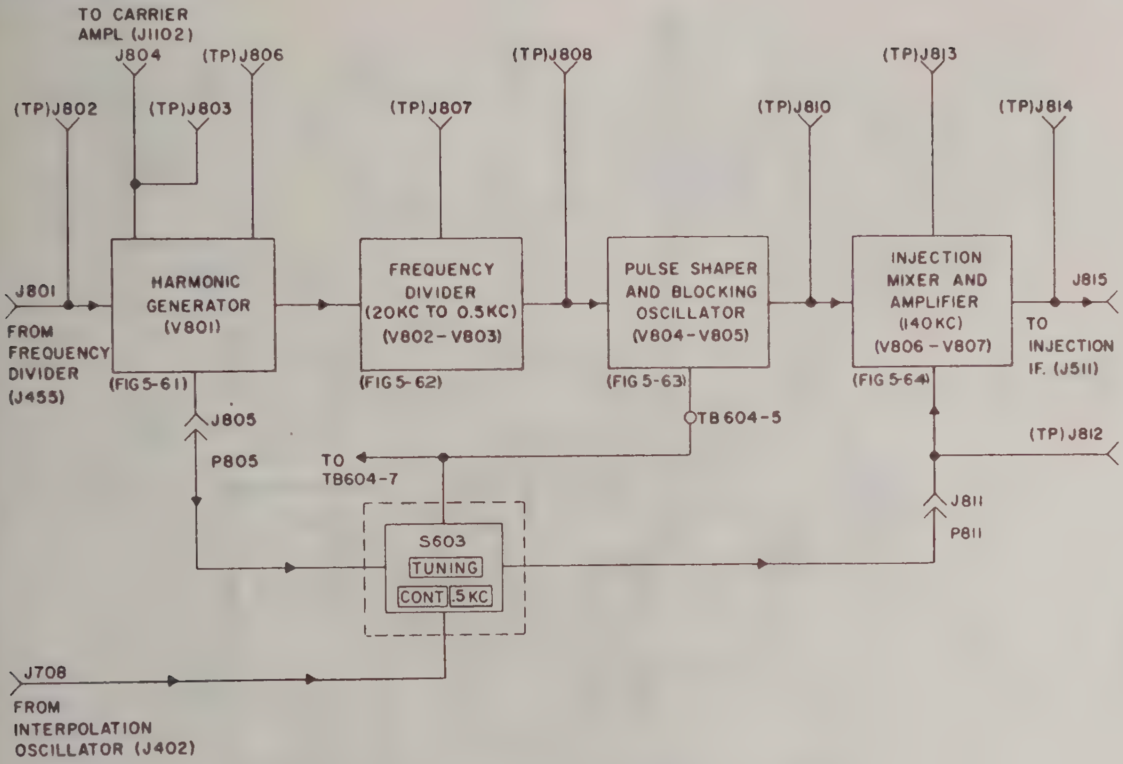

TO CARRIER AMPL (J1102)
J804
(TP)J806
(TP)J808
(TP)J813
(TP)J802
(TP)J803
(TP)J807
(TP)J810
(TP)J814
J801
FROM FREQUENCY DIVIDER (J455)
HARMONIC GENERATOR (V801)
(FIG 5-61)
FREQUENCY DIVIDER (20KC TO 0.5KC) (V802-V803)
(FIG 5-62)
PULSE SHAPER AND BLOCKING OSCILLATOR (V804-V805)
(FIG 5-63)
INJECTION MIXER AND AMPLIFIER (140KC) (V806-V807)
(FIG 5-64)
J815
TO INJECTION IF. (J511)
J805
P805
TO TB604-7
TB 604-5
(TP) J812
J811
P811
S603
TUNING
CONT
.5 KC
J708
FROM INTERPOLATION OSCILLATOR (J402)

Figure 5-60. Synthesizer, Functional Block Diagram

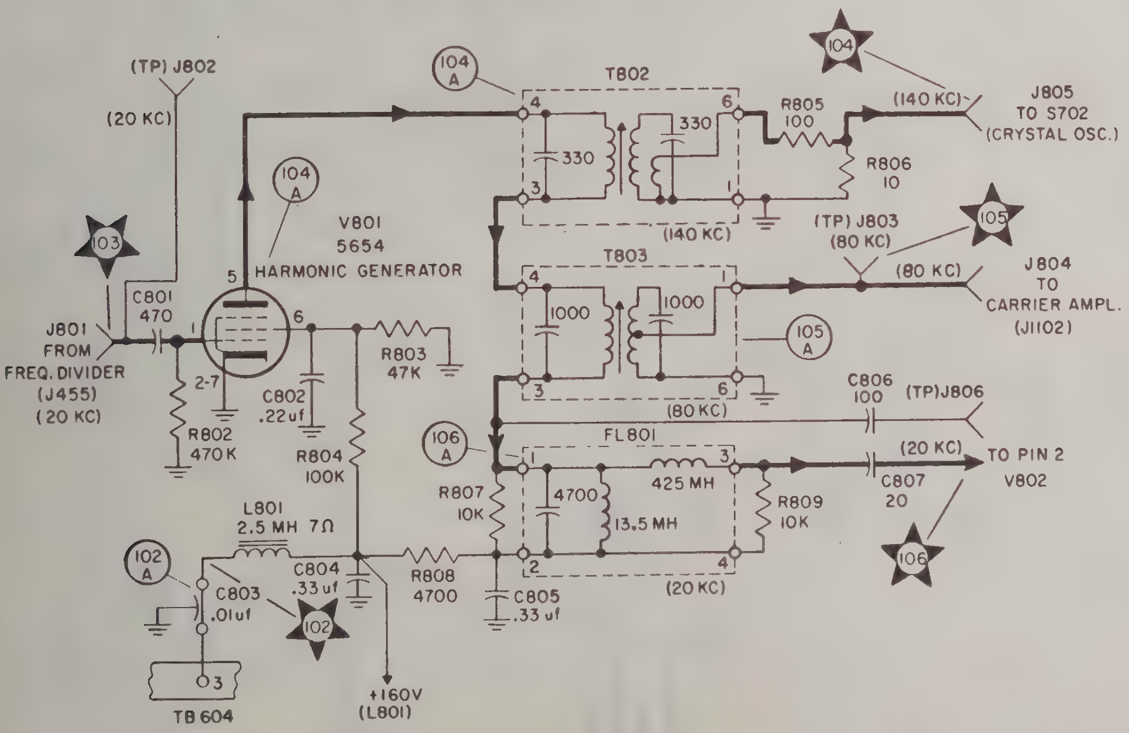

(TP) J802
(20 KC)
104 A
T802
104
(140 KC)
J805 TO S702 (CRYSTAL OSC.)
4
6
330
330
R805 100
R806 10
3
1
(140 KC)
104 A
V801 5654 HARMONIC GENERATOR
103
(TP) J803 (80 KC)
105
T803
(80 KC)
J804 TO CARRIER AMPL. (J1102)
5
6
1
4
1000
1000
105 A
J801 FROM FREQ. DIVIDER (J455) (20 KC)
C801 470
2-7
R802 470K
C802 .22uf
R803 47K
R804 100K
3
6
(80 KC)
C806 100
(TP)J806
106 A
FL801
1
3
(20 KC)
TO PIN 2 V802
4700
425 MH
13.5 MH
R807 10K
R809 10K
C807 20
106
2
4
(20 KC)
L801 2.5 MH 7Ω
102 A
C803 .01uf
C804 .33 uf
102
R808 4700
C805 .33 uf
3
TB 604
+160V (L801)

Figure 5-61. Synthesizer, Harmonic Generator, Functional Schematic Diagram

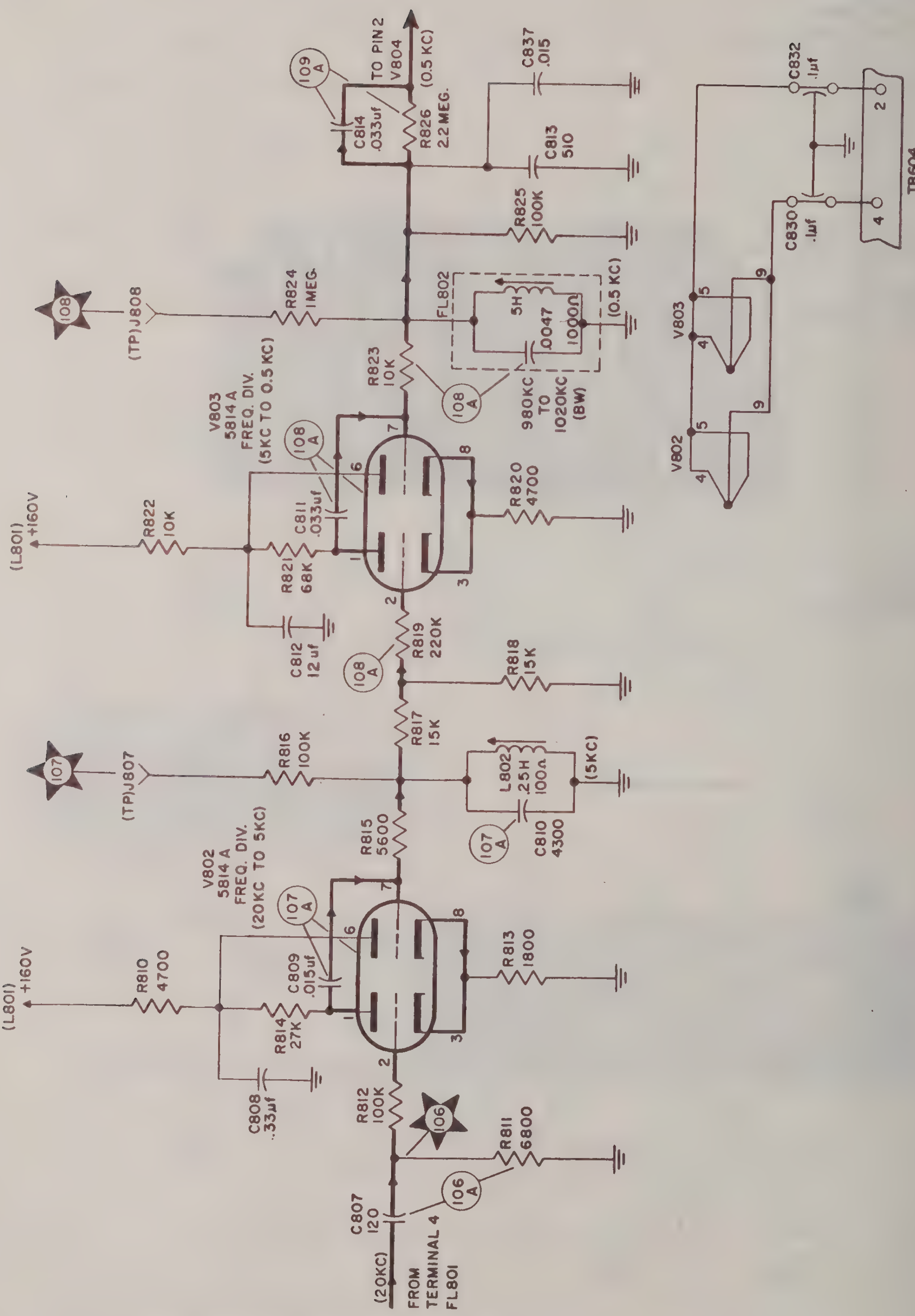

(20KC)
FROM TERMINAL 4 FL801
C807 120
106 A
106
R811 6800
R812 100K
C808 .33µf
(L801) +160V
R810 4700
R814 27K
C809 .015uf
107 A
V802 5814 A FREQ. DIV. (20KC TO 5KC)
1
2
3
6
7
8
R813 1800
R815 5600
107 A
C810 4300
L802 .25H 100Ω
(5KC)
107
(TP)J807
R816 100K
R817 15K
R818 15K
108 A
R819 220K
C812 12 uf
(L801) +160V
R822 10K
R821 68K
C811 .033uf
108 A
V803 5814 A FREQ. DIV. (5KC TO 0.5 KC)
R820 4700
R823 10K
108 A
980KC TO 1020KC (BW)
FL802
.0047
5H
1000Ω
(0.5 KC)
108
(TP)J808
R824 1MEG.
R825 100K
C813 510
C837 .015
C814 .033uf
R826 2.2MEG.
109 A
TO PIN 2 V804
(0.5 KC)
V802
V803
4
5
9
C830 .1µf
C832 .1µf
TB604
2
4

Figure 5-62. Synthesizer, Frequency Divider, Functional Schematic Diagram

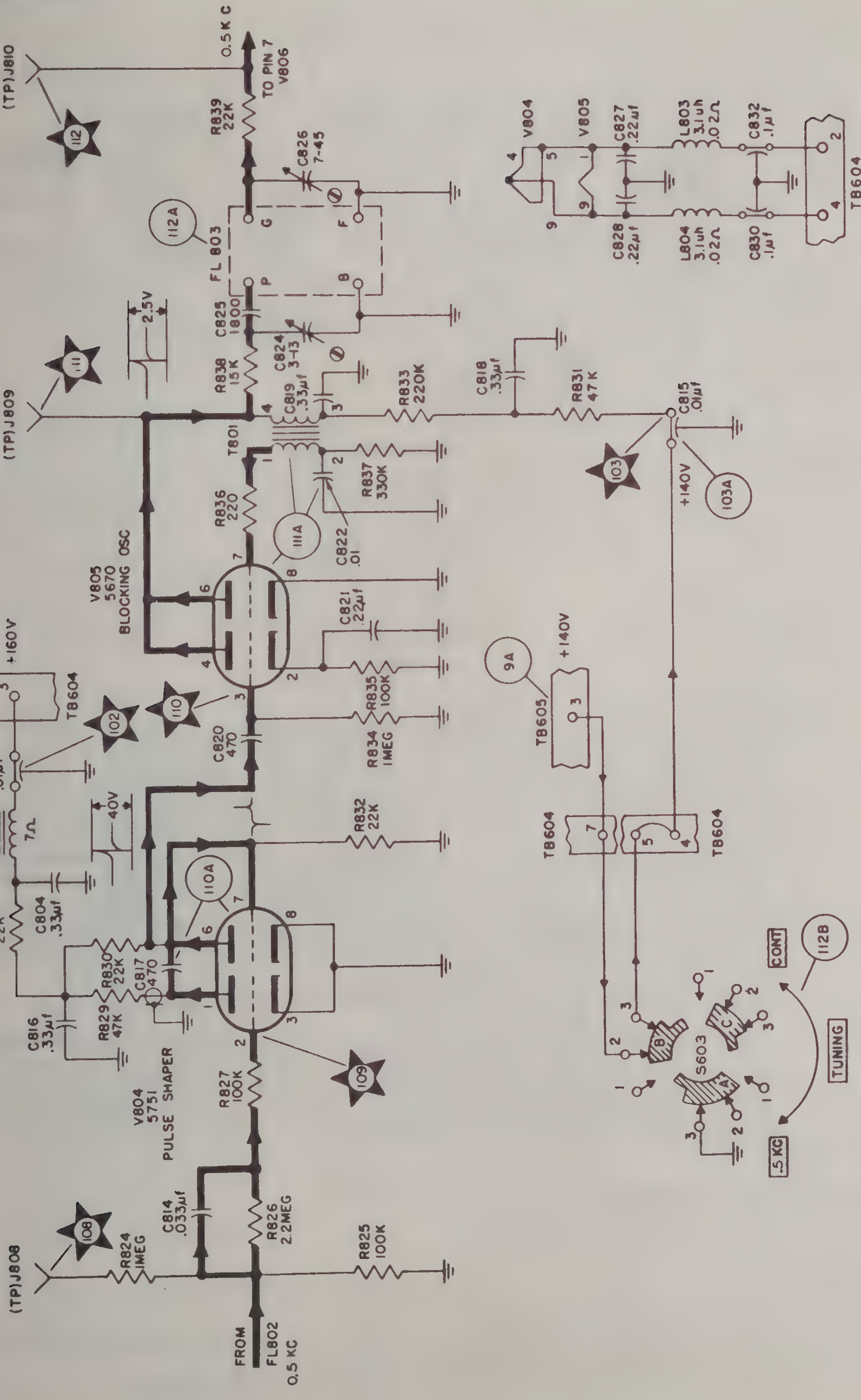

(TP) J808
108
R824 1MEG
C814 .033µf
R826 2.2MEG
R825 100K
FROM FL802 0.5 KC
V804 5751 PULSE SHAPER
R827 100K
109
C816 .33µf
R829 47K
R830 22K
C817 470
R828 22K
C804 .33µf
L801 2.5 MH 7Ω
C803 .01µf
110A
R832 22K
40V
102
TB604
3
+160V
110
C820 470
R834 1MEG
R835 100K
C821 .22µf
V805 5670 BLOCKING OSC
R836 220
111A
C822 .01
R837 330K
T801
C819 .33µf
(TP) J809
111
R838 15K
C824 3-13
C825 1800
2.5V
R833 220K
C818 .33µf
R831 47K
C815 .01µf
103
103A
+140V
FL 803
112A
P
G
B
F
C826 7-45
R839 22K
TO PIN 7 V806
0.5 K C
(TP) J810
112
V804
V805
C827 .22µf
C828 .22µf
L803 3.1uh .02Ω
L804 3.1uh .02Ω
C832 .1µf
C830 .1µf
TB604
9A
+140V
TB605
TB604
S603
A
B
C
.5 KC
TUNING
CONT
112B

Figure 5-63. Synthesizer, Pulse Shaper and Blocking Oscillator, Functional Schematic Diagram

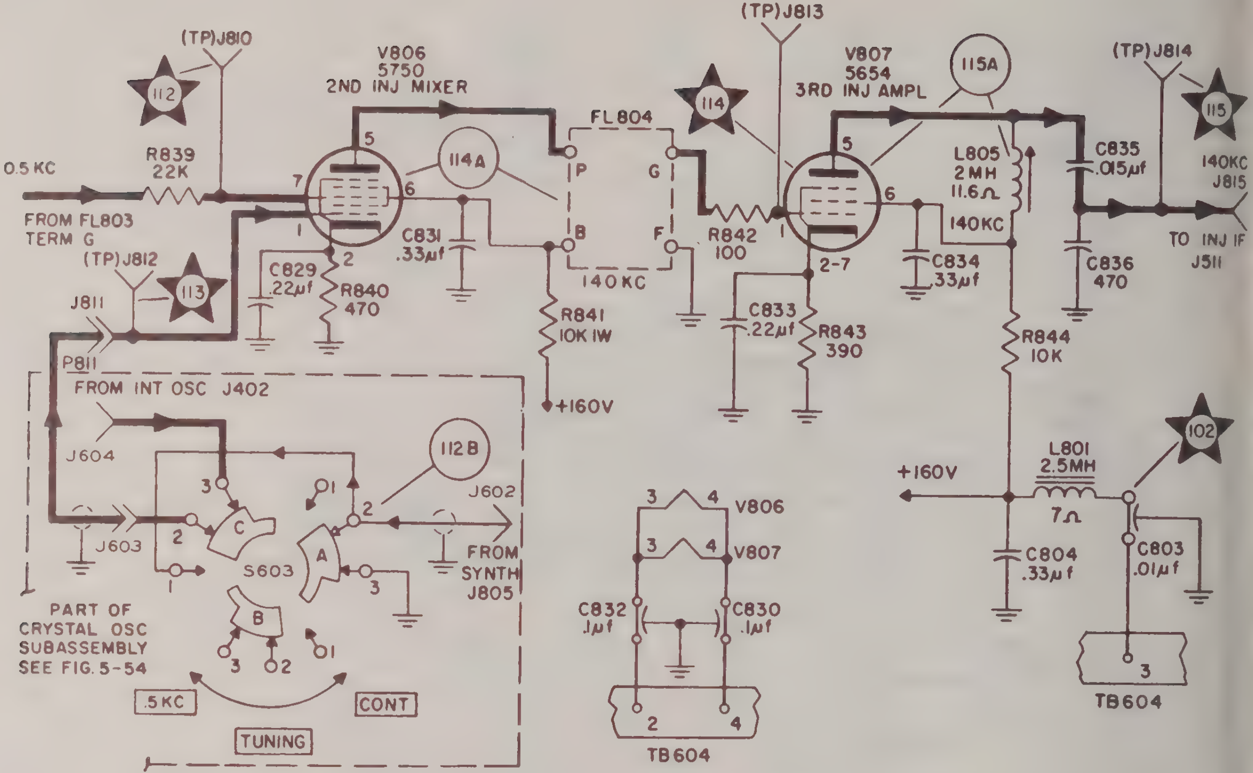

(TP)J810
112
V806
5750
2ND INJ MIXER
(TP)J813
114
V807
5654
3RD INJ AMPL
115A
(TP)J814
115
R839
22K
0.5 KC
FROM FL803
TERM G
FL804
114A
P
G
B
F
140 KC
C831
.33μf
C829
.22μf
R840
470
(TP)J812
113
J811
P811
R841
10K 1W
+160V
R842
100
C833
.22μf
R843
390
L805
2 MH
11.6Ω
140KC
C834
.33μf
R844
10K
C835
.015μf
C836
470
140KC
J815
TO INJ IF
J511
FROM INT OSC J402
J604
112B
J602
J603
S603
A
B
C
FROM
SYNTH
J805
PART OF
CRYSTAL OSC
SUBASSEMBLY
SEE FIG. 5-54
.5 KC
CONT
TUNING
V806
V807
C832
.1μf
C830
.1μf
TB604
+160V
L801
2.5MH
7Ω
102
C804
.33μf
C803
.01μf
TB604

Figure 5-64. Synthesizer, Injection Mixer-Amplifier (140 Kc), Functional Schematic Diagram

opening of the converter drawer, attach patch cable W624 between connectors P601 on the rear of the converter drawer and J951 on the converter blister. For convenience in reaching the connectors, raise the drawer to its vertical position. Figure 5-65 shows the location of synthesizer parts.

d. PRELIMINARY CHECK.—Before trouble-shooting the synthesizer, check the following, with the power off:

(1) Seating of tubes V801 through V807 in their sockets

(2) Cable connections at J801, J804, J805, J811, and J815

(3) All soldered connections at chassis feed-through terminals

(4) Normal mechanical function of TUNING switch S702.

e. TEST EQUIPMENT AND SPECIAL TOOLS.—Use Multimeter AN/PSM-4B, VTVM ME-6D/U, VTVM ME-30/U, Signal Generator AN/URM-25D and Oscilloscope OS-8C/U, or equivalents. No special tools are required.

f. CONTROL SETTINGS.—Place the panel controls in the positions listed in table 5-2. Place POWER switch to the ON position and allow 30 seconds for warm-up.

g. SYNTHESIZER TROUBLE-SHOOTING CHART.—Table 5-16 lists the steps for measuring supply voltages and stage-by-stage signal tracing in the synthesizer. Compare the results with those listed in the NORMAL INDICATION column and follow the instructions given in the NEXT STEP column. Figure 5-66 shows the location of test points. Table 6-7 gives values for voltage and resistance measurements.

5-21. LSB DETECTOR-AMPLIFIER.

a. DIAGRAMS.—Figure 5-67 is a functional block diagram of the LSB detector-amplifier assembly. For a complete schematic diagram, refer to figure 6-19. Functional schematic diagrams of the individual circuits in the assembly are as follows:

Figure	*Circuit*
5-68	82 kc IF amplifier
5-69	AGC amplifier
5-70	Demodulator and carrier amplifier
5-71	Audio amplifier

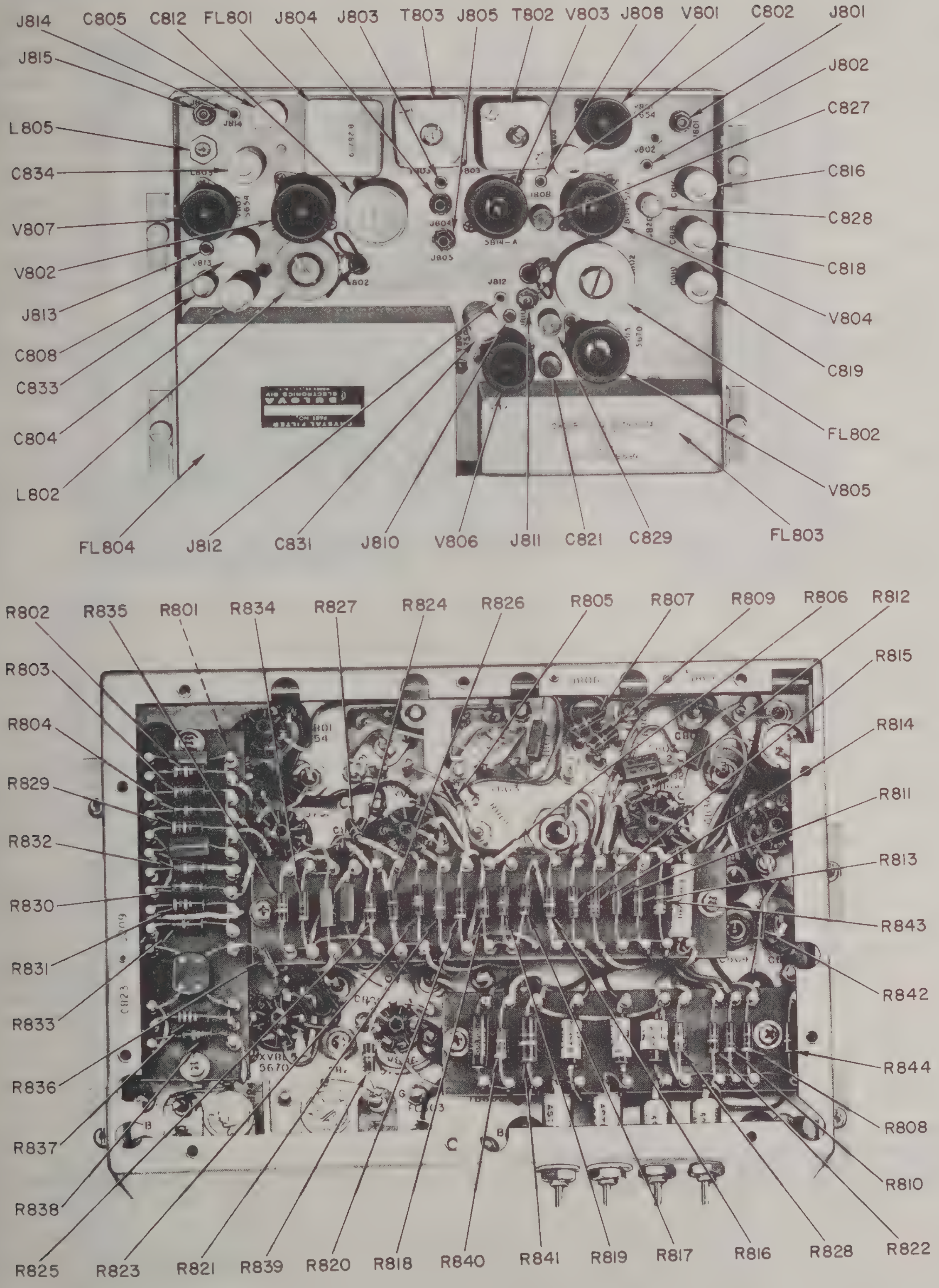

J814
C805
C812
FL801
J804
J803
T803
J805
T802
V803
J808
V801
C802
J801
J815
J802
C827
L805
C834
C816
C828
V807
V802
C818
J813
V804
C808
C833
C819
C804
FL802
L802
V805
FL804
J812
C831
J810
V806
J811
C821
C829
FL803
R802
R835
R801
R834
R827
R824
R826
R805
R807
R809
R806
R812
R803
R815
R804
R814
R829
R811
R832
R813
R830
R843
R831
R842
R833
R844
R836
R808
R837
R810
R838
R825
R823
R821
R839
R820
R818
R840
R841
R819
R817
R816
R828
R822

Figure 5-65. Synthesizer, Location of Parts (Sheet 1 of 2)

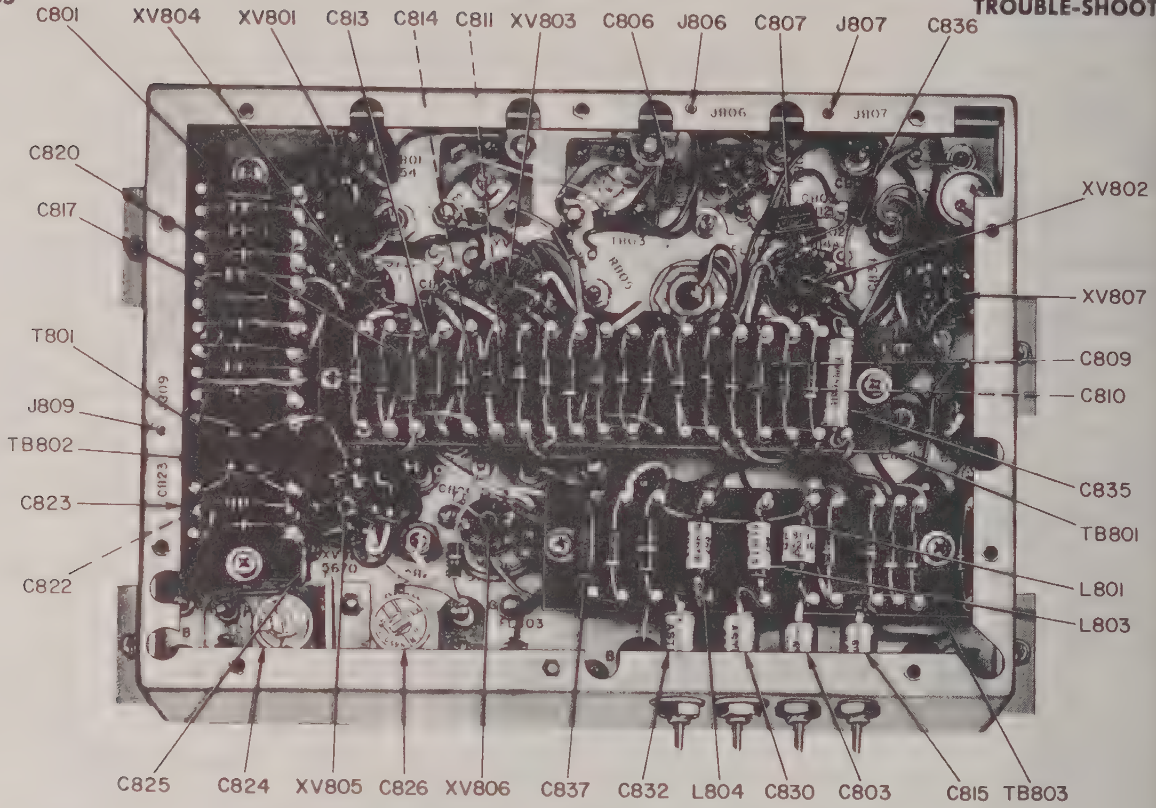

C801
XV804
XV801
C813
C814
C811
XV803
C806
J806
C807
J807
C836
C820
C817
XV802
XV807
T801
C809
C810
J809
TB802
C823
C835
TB801
C822
L801
L803
C825
C824
XV805
C826
XV806
C837
C832
L804
C830
C803
C815
TB803

Figure 5-65. Synthesizer, Location of Parts (Sheet 2 of 2)

TABLE 5-16. SYNTHESIZER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	102 102A 103 Figs. 5-60 5-61 5-65 5-66	Connect multimeter between chassis and feedthrough capacitors. Select the 200 vdc range; tolerance ±20%.	C803: +160 vdc	If indication is abnormal, refer to table 5-5. Check C803. WARNING Turn off power before making ohmmeter measurements.
			C815: +160 vdc	See above. Check C815. NOTE: TUNING switch must be in the 0.5 KC position for this test.
2	105 105A	Disconnect plugs P801, P815, P811, P805, and P804 from J801, J815, J811, J805, and J804. Connect signal generator to J801; adjust for a 20 kc output (800 mv). Measure signal at test points with VTVM ME-30/U.	TP J803: 1.5 to 2 vac (80 kc)	If indication is abnormal, replace V801. Check socket pin voltages. Check T803.
			J805: 0.35 vac (140 kc)	If indication is abnormal, check T802, R805, and R806.
			Junction of R811 and R812: 3.5 vac (20 kc)	If indication is abnormal, check C807, R811, and R812. Check FL801.

TABLE 5-16. SYNTHESIZER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	104 107A Figs. 5-61 5-62			
3	107 103 Figs. 5-61 5-62	Connect oscilloscope Y axis to TP J807 and X axis to TP J802. With signal generator connected as in step 2, note Lissajou pattern on oscilloscope.	Lissajou: 4.1 ratio	If indication is abnormal, replace V802. Check socket pin voltages. Refer to Section 6 for L802 synthesizer alignment instructions. Check C807 and C809. Check L802.
4	107 108	Connect oscilloscope Y axis to TP J807 and X axis to TP J808. Note Lissajou pattern.	Lissajou: 10.1 ratio	If indication is abnormal, replace V803. Check socket pin voltages. Refer to Section 6 for FL802 synthesizer alignment instructions. Check C811 and R823.
5	110 110A Figs. 5-63 5-65 5-66 Table 6-7	Connect oscilloscope Y axis to pin 3 of V805. Adjust oscilloscope sweep for 200 cps and sync with 0.5 kc input. Note pattern of 0.5 kc pips. Connect VTVM to pin 3 of V805 and measure peak-to-peak voltage.	V805, pin 3: 40 v p/p (approximately)	If indication is abnormal, replace V804. Check socket pin voltages. Check C817 and C820.
6	111 Figs. 5-63 5-65 5-66 Table 6-7	Connect oscilloscope Y axis to TP J809. Adjust oscilloscope sweep for 200 cps and sync with input. Note pattern of 0.5 kc pips. Connect VTVM to TP J809. Measure peak-to-peak voltage.	TP J809: 2 to 5 v p/p (approximately)	If indication is abnormal, replace V805. Check socket pin voltages. Check T801, C819, and C822. NOTE: TUNING switch must be in 0.5 KC position for this test.
7	111 112 Figs. 5-63 5-65 5-66	Remove V805 and connect the signal generator to TP J809. Adjust for a 770 kc output (2 v). Measure signal at TP J810 with VTVM ME-30/U.	TP J810: .005 to .01 vac	If indication is abnormal, check FL803, C825, and R839. Alignment instructions for FL803 are given in Section 6.

TABLE 5-16. SYNTHESIZER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
8	113 115 114A 115A Figs. 5-64 5-65 5-66 Table 6-7	Replace V805 and connect the signal generator to TP J812. Adjust for a 580 kc output (2 v). Measure signal at TP J814 with ME-30/U while slowly tuning the generator between 580 and 680 kc.	TP J814: 2 to 5 vac. VTVM should peak at each 0.5 kc change in the signal generator tuning. (Signal frequency is 140 kc.)	If indication is abnormal, check V806 and V807. Check socket pin voltages. Check FL804. Alignment instructions for L805 are given in Section 6.

b. ACCESS.—The LSB detector-amplifier is located in the lower demodulator deck. Raise the upper deck for access to the top; tilt the whole drawer for access to the bottom. Figure 5-72 shows the location of parts and figure 5-73 the location of test points.

c. PRELIMINARY CHECK.—Before trouble-shooting the LSB detector-amplifier, check the following with the power off:

(1) Seating of tubes V1101 through V1109 in their sockets

(2) Cable connections at J1101, J1102, J1103, and TB1101

(3) Soldered connections at chassis feed-through terminals

(4) Mechanical operation of panel controls A.F. LEVEL LINE A, A.G.C. LOWER ON/S.S.B./OFF, A.G.C. LOWER SLOW/FAST, and RECEPTION A.M./S.S.B.

WARNING

Potentials as high as 210 volts rms are present in the power-supply circuits. Avoid contact.

d. TEST EQUIPMENT AND SPECIAL TOOLS.—Use Multimeter AN/PSM-4B, VTVM ME-30/U, VTVM ME-6D/U, and Signal Generator AN/URM-25D. No special tools are required.

e. CONTROL SETTINGS.—Set the panel controls to the position shown in table 5-2. Exceptions are made in certain steps of the trouble-shooting chart. Place POWER switch to the ON position and allow 30 seconds for warm-up. Place RECEPTION switch to the SSB position.

f. LSB DETECTOR-AMPLIFIER TROUBLE-SHOOTING CHART.—Table 5-17 is the trouble-shooting chart for the LSB detector-amplifier. Perform the steps in the order given. Compare the results with those listed in the NORMAL INDICATION column and follow instructions given in the NEXT STEP column. Table 6-9 gives voltage and resistance measurements for the tube pins.

5-22. CONVERTER BLISTER.

a. FUNCTION.—The converter blister is a junction box for cable connections to and from the converter and between the converter and the demodulator. Faulty operation of its circuits will seriously impair, or fully disable, receiver operation. Figure 5-74 is a functional schematic diagram of the converter blister circuits.

b. ACCESS.—The converter blister is located at the back of the converter cabinet. For access, pull out the converter drawer all the way. Reel E951 in the blister pays out the ac power cable as the drawer is withdrawn, but signal connections are broken. To restore them, connect patch cable W624 between the blister and drawer connection blocks. Figure 5-75 shows the location of parts of the converter blister.

c. PRELIMINARY CHECK.—Before trouble-shooting the converter blister, inspect the following with the power off:

(1) Power connections P955 and J605

(2) Cable connections on the outside of the blister.

d. TEST EQUIPMENT AND SPECIAL TOOLS.—Besides the patch cable, the only equipment needed to trouble-shoot the blister is Multimeter AN/PSM-4B.

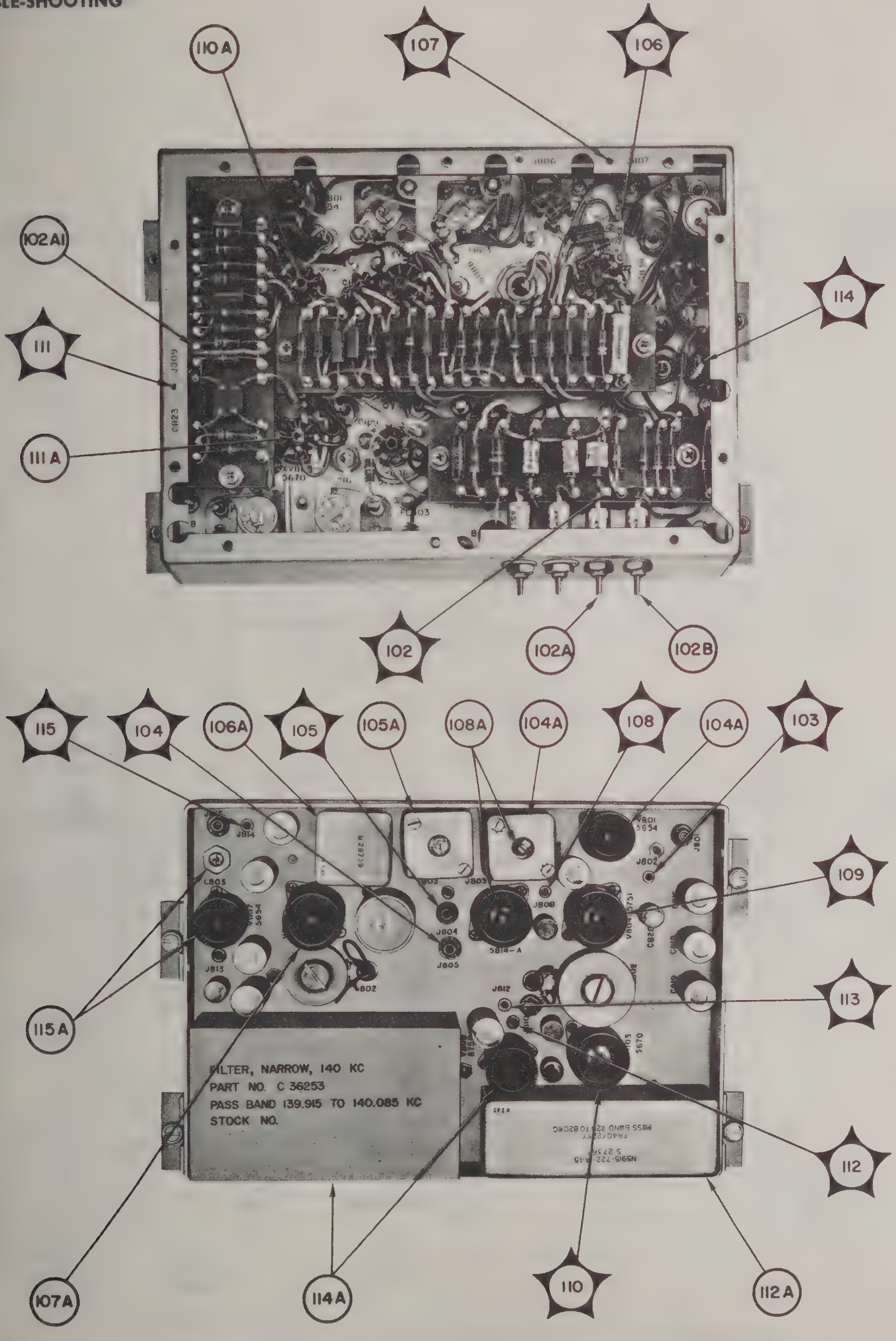

110A
107
106
102A1
114
111
111A
102
102A
102B
J309
CR23
J807
115
104
106A
105
105A
108A
104A
108
104A
103
109
113
112
115A
107A
114A
110
112A
J814
L805
J813
J802
J803
J804
J805
J808
J812
J802
V801
5654
5B14-A
FILTER, NARROW, 140 KC
PART NO. C 36253
PASS BAND 139.915 TO 140.085 KC
STOCK NO.

Figure 5-66. Synthesizer, Location of Test Points

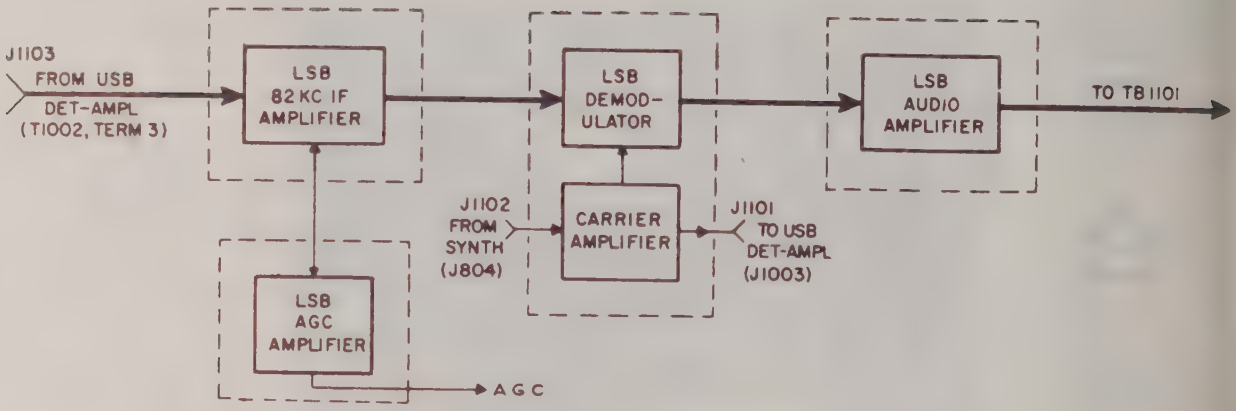

J1103
FROM USB
DET-AMPL
(T1002, TERM 3)
LSB
82 KC IF
AMPLIFIER
LSB
DEMOD-
ULATOR
LSB
AUDIO
AMPLIFIER
TO TB1101
J1102
FROM
SYNTH
(J804)
CARRIER
AMPLIFIER
J1101
TO USB
DET-AMPL
(J1003)
LSB
AGC
AMPLIFIER
AGC

Figure 5-67. LSB-Amplifier, Functional Block Diagram

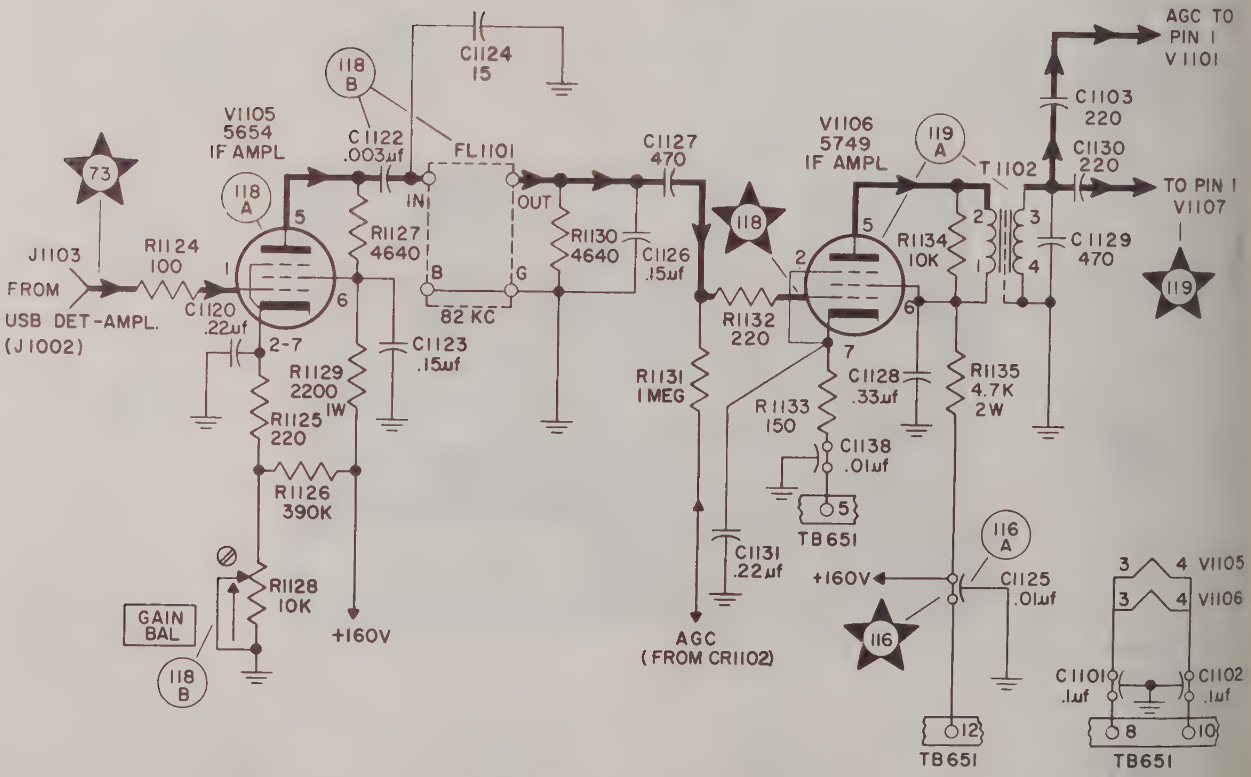

73
J1103
FROM
USB DET-AMPL.
(J1002)
R1124
100
C1120
.22µf
V1105
5654
IF AMPL
118
A
118
B
C1122
.003µf
C1124
15
FL1101
IN
OUT
B
G
82 KC
R1127
4640
R1129
2200
1W
C1123
.15µf
R1125
220
R1126
390K
R1128
10K
GAIN
BAL
118
B
+160V
2-7
C1127
470
R1130
4640
C1126
.15µf
118
R1131
1 MEG
R1132
220
C1131
.22µf
AGC
(FROM CR1102)
V1106
5749
IF AMPL
119
A
T1102
R1134
10K
R1133
150
C1128
.33µf
C1138
.01µf
TB651
R1135
4.7K
2W
116
A
+160V
C1125
.01µf
116
TB651
C1103
220
C1130
220
AGC TO
PIN 1
V1101
TO PIN 1
V1107
C1129
470
119
3
4
V1105
V1106
C1101
.1µf
C1102
.1µf
8
10
12
5
TB651

Figure 5-68. LSB Detector-Amplifier, 80 Kc Amplifier, Functional Schematic Diagram

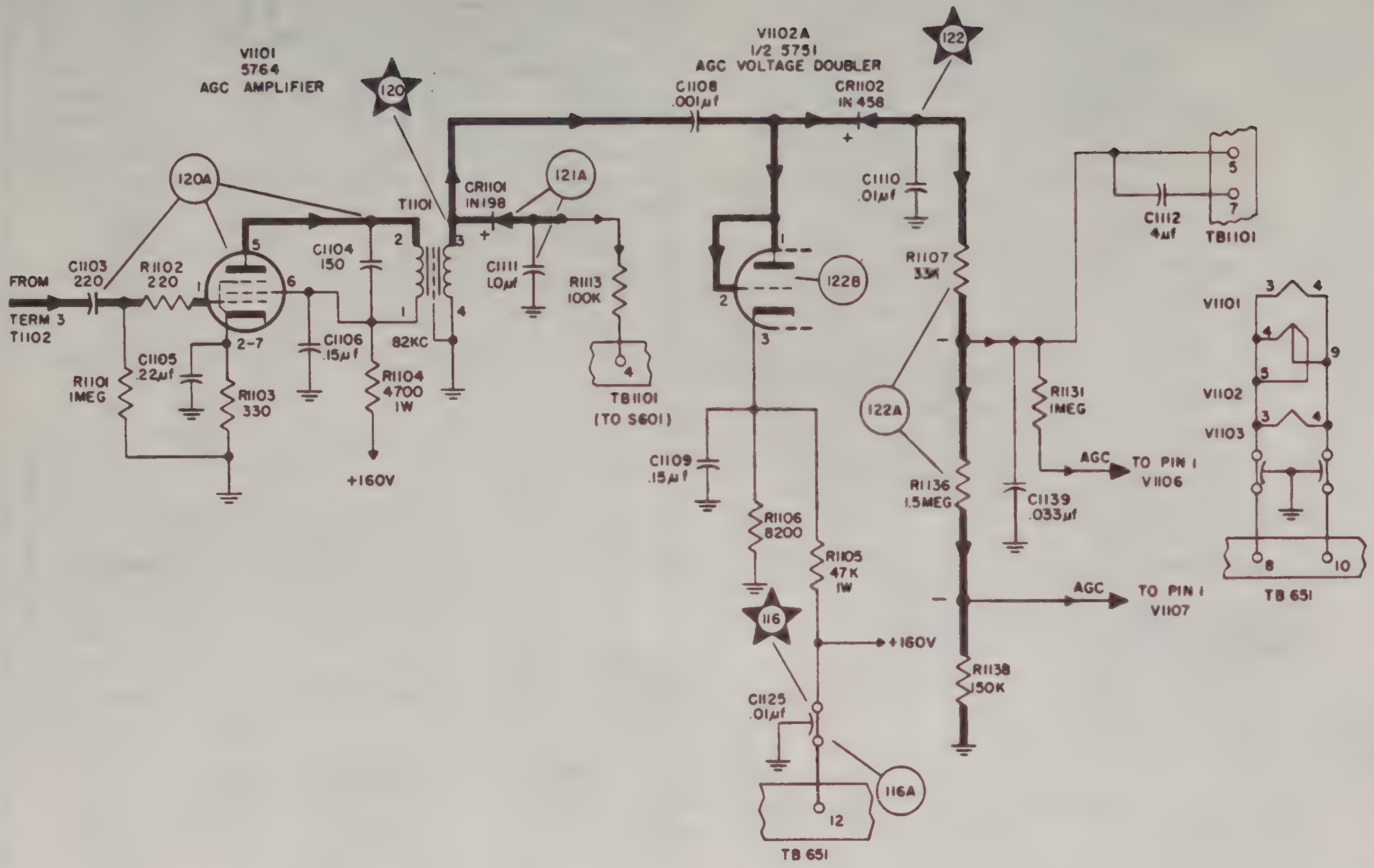

V1101
5764
AGC AMPLIFIER
120
120A
FROM
TERM 3
T1102
C1103
220
R1102
220
R1101
1MEG
C1105
.22µf
R1103
330
1
5
6
2-7
C1104
150
C1106
.15µf
R1104
4700
1W
+160V
T1101
2
1
3
4
82KC
CR1101
1N198
+
121A
C1111
1.0µf
R1113
100K
TB1101
(TO S601)
4
V1102A
1/2 5751
AGC VOLTAGE DOUBLER
C1108
.001µf
CR1102
1N 458
+
122
C1110
.01µf
122B
1
2
3
C1109
.15µf
R1106
8200
R1105
47K
1W
+160V
116
C1125
.01µf
116A
TB 651
12
R1107
33K
122A
R1136
1.5MEG
R1138
150K
–
–
R1131
1MEG
C1139
.033µf
AGC
TO PIN 1
V1106
AGC
TO PIN 1
V1107
C1112
4µf
TB1101
5
7
V1101
V1102
V1103
3
4
4
5
9
3
4
TB 651
8
10

Figure 5-69. LSB Detector-Amplifier, AGC Amplifier, Functional Schematic Diagram

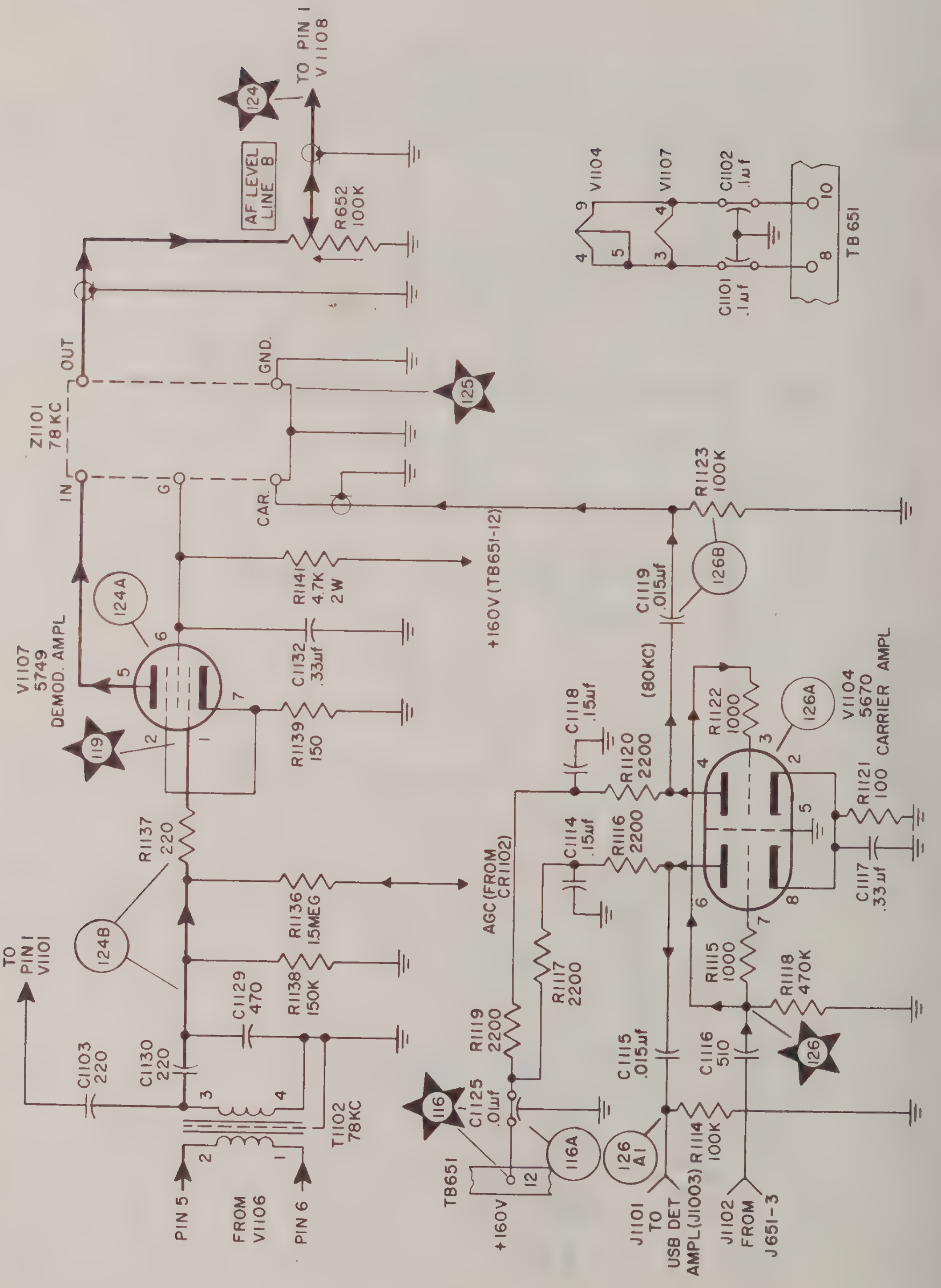

TO PIN 1 V1108
124
AF LEVEL LINE B
R652 100K
Z1101 78KC
IN
OUT
G1
GND.
CAR.
125
V1107 5749 DEMOD. AMPL
124A
119
R1141 4.7K 2W
C1132 .33uf
R1139 150
+160V (TB651-12)
TO PIN 1 V1101
124B
R1137 220
R1136 1.5MEG
AGC (FROM CR1102)
C1129 470
R1138 150K
C1103 220
C1130 220
T1102 78KC
PIN 5
FROM V1106
PIN 6
116
C1125 .01uf
116A
TB651
12
+160V
R1119 2200
R1117 2200
C1114 .15uf
R1116 2200
C1118 .15uf
R1120 2200
(80KC)
C1119 .015uf
126B
R1123 100K
R1122 1000
126A
V1104 5670 CARRIER AMPL
R1121 100
C1117 .33uf
R1115 1000
R1118 470K
126
C1115 .015uf
C1116 510
126 A1
R1114 100K
J1101 TO USB DET AMPL (J1003)
J1102 FROM J651-3
V1104
V1107
C1102 .1uf
C1101 .1uf
TB 651
8
10

Figure 5-70. LSB Detector-Amplifier, Demodulator and Carrier Amplifier, Functional Schematic Diagram

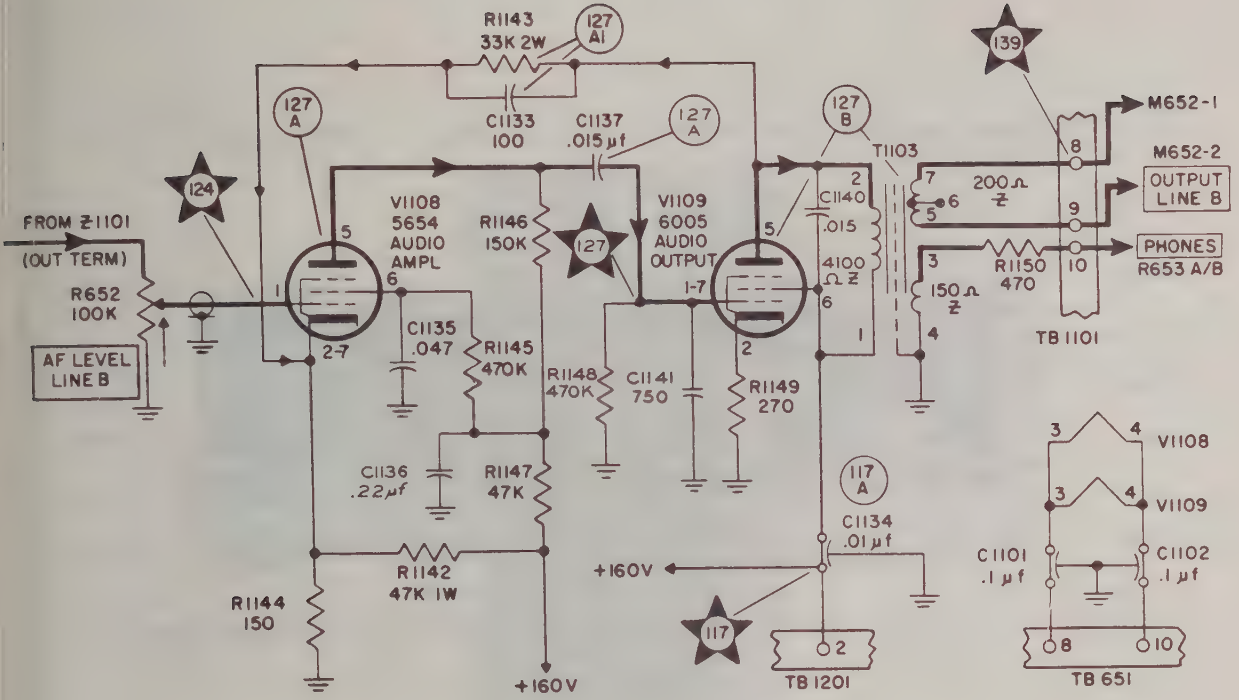

R1143
33K 2W
127 A1
C1133
100
C1137
.015 µf
127 A
127 A
127 B
139
T1103
M652-1
M652-2
OUTPUT LINE B
PHONES
R653 A/B
124
FROM Z1101
(OUT TERM)
R652
100K
AF LEVEL LINE B
V1108
5654
AUDIO
AMPL
R1146
150K
127
V1109
6005
AUDIO
OUTPUT
C1140
.015
4100 Ω Z
200 Ω Z
R1150
470
150 Ω Z
TB 1101
C1135
.047
R1145
470K
R1148
470K
C1141
750
R1149
270
V1108
V1109
C1136
.22 µf
R1147
47K
117 A
C1134
.01 µf
R1142
47K 1W
+160V
C1101
.1 µf
C1102
.1 µf
R1144
150
117
TB 1201
TB 651
+160V

Figure 5-71. LSB Detector-Amplifier, Audio Amplifier, Functional Schematic Diagram

e. CONTROL SETTINGS.—All tests on the converter blister are made with the power off. Control settings do not affect the trouble-shooting procedures for the converter blister.

f. CONVERTER BLISTER TROUBLE-SHOOTING CHART.—Table 5-18 is the trouble-shooting chart for the converter blister. Use the lowest resistance range of the multimeter to measure circuit continuity and the highest range to find high-resistance leakage between normally open circuits. Make measurements at patch-cable connector J601 with P951 plugged into blister connector J951. Perform the steps in the order given, compare the results with those in the NORMAL INDICATION column, and follow the instructions given in the NEXT STEP column. Figure 5-76 shows the location of test points.

It is not necessary to remove the blister for the tests in table 5-18, but it may be removed for a more complete inspection. For removal instructions, see Section 6.

5-23. DEMODULATOR BLISTER.

a. FUNCTION.—The demodulator blister provides cable terminations for all demodulator input and output connections. It contains also:

(1) RF filter FL1803 (ac power input)

(2) Audio output filters for line A (FL1801) and line B (FL1802)

Faulty operation of the blister will seriously impair, or fully disable, receiver operation. Figure 5-77 is a functional schematic diagram of the demodulator blister.

b. ACCESS.—The demodulator blister is at the rear of the demodulator cabinet. For access, simply open the demodulator drawer. This will not break connections. Figure 5-78 shows the location of parts.

c. PRELIMINARY CHECK.—Before trouble-shooting the demodulator blister, check the following with the power off:

(1) Connector P1801 (should be secure to J651 on the chassis)

(2) Outside connectors.

For a more thorough inspection, refer to Section 6 for instructions for removing the blister.

d. TEST EQUIPMENT AND SPECIAL TOOLS.—Multimeter AN/PSM-4B is the only equipment needed for trouble-shooting the blister.

e. CONTROL SETTINGS.—The demodulator blister is tested with the power off. The control settings do not affect the trouble-shooting procedures for the demodulator blister.

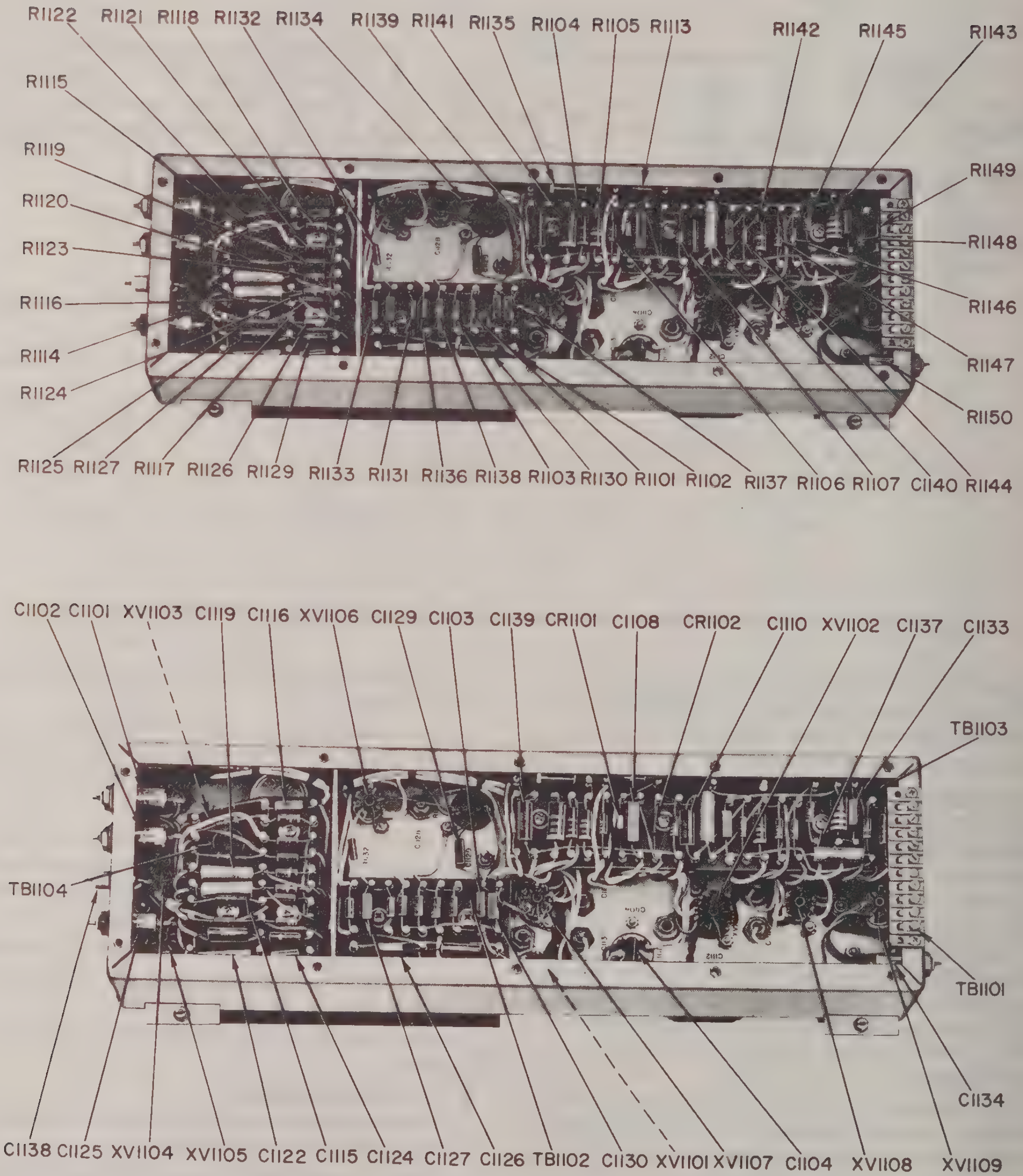

R1122
R1121
R1118
R1132
R1134
R1139
R1141
R1135
R1104
R1105
R1113
R1142
R1145
R1143
R1115
R1119
R1120
R1123
R1116
R1114
R1124
R1149
R1148
R1146
R1147
R1150
R1125
R1127
R1117
R1126
R1129
R1133
R1131
R1136
R1138
R1103
R1130
R1101
R1102
R1137
R1106
R1107
C1140
R1144
C1102
C1101
XV1103
C1119
C1116
XV1106
C1129
C1103
C1139
CR1101
C1108
CR1102
C1110
XV1102
C1137
C1133
TB1103
TB1104
TB1101
C1134
C1138
C1125
XV1104
XV1105
C1122
C1115
C1124
C1127
C1126
TB1102
C1130
XV1101
XV1107
C1104
XV1108
XV1109

Figure 5-72. LSB Detector-Amplifier, Location of Parts (Sheet 1 of 2)

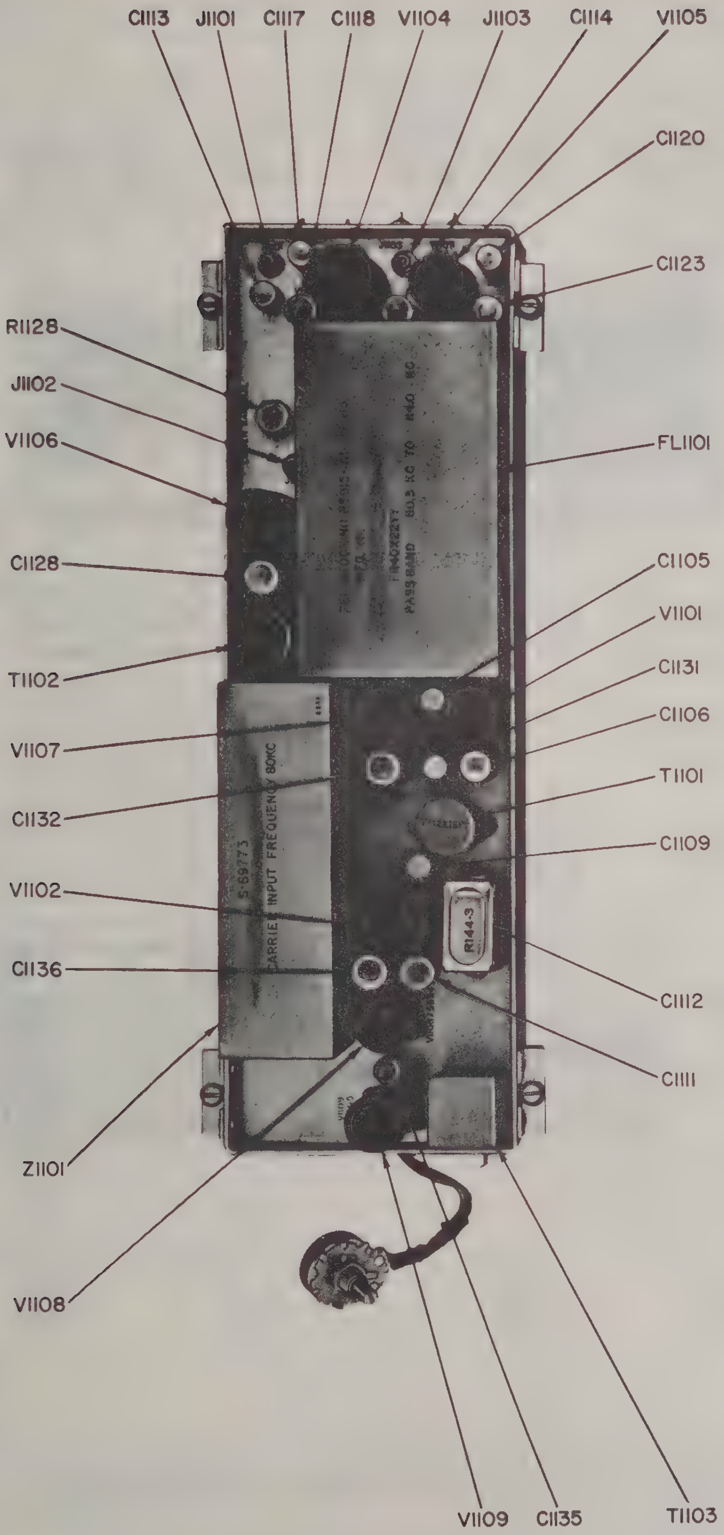

C1113
J1101
C1117
C1118
V1104
J1103
C1114
V1105
C1120
C1123
R1128
J1102
V1106
FL1101
C1128
C1105
V1101
T1102
C1131
C1106
V1107
T1101
C1132
C1109
V1102
C1136
C1112
C1111
Z1101
V1108
V1109
C1135
T1103
CARRIER INPUT FREQUENCY 80KC
5-69773
R144-3
PASS BAND 80.5 KC TO 84.0 KC

Figure 5-72. LSB Detector-Amplifier, Location of Parts
(Sheet 2 of 2)

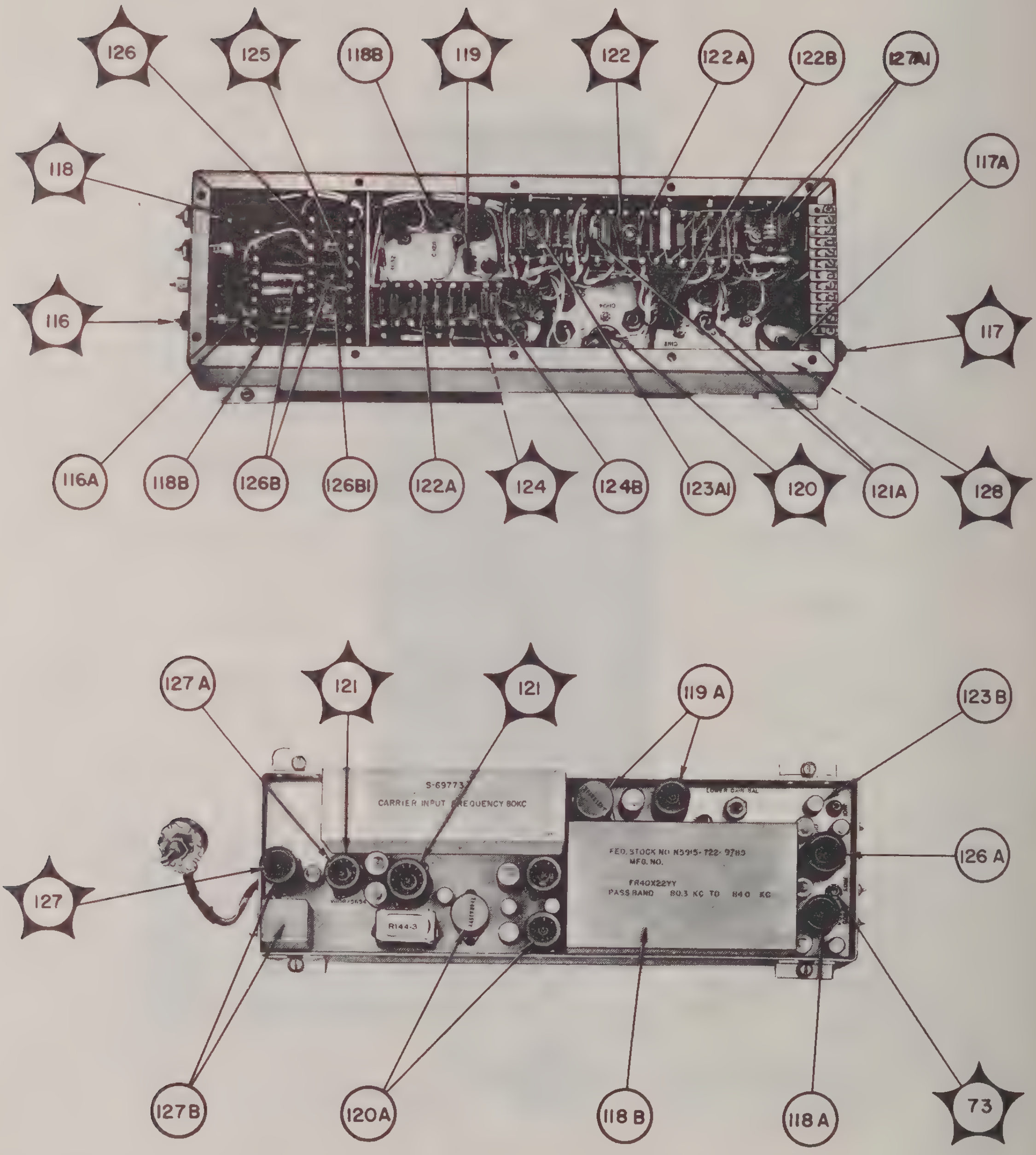

126
125
118B
119
122
122A
122B
127A1
118
117A
116
117
116A
118B
126B
126B1
122A
124
124B
123A1
120
121A
128
127 A
121
121
119 A
123 B
S-69773
CARRIER INPUT FREQUENCY 80KC
FED. STOCK NO N5915-722-9785
MFG. NO.
FR40X22YY
PASS BAND 80.3 KC TO 84.0 KC
R144-3
126 A
127
127B
120A
118 B
118 A
73

Figure 5-73. LSB Detector-Amplifier, Location of Test Points

TABLE 5-17. LSB DETECTOR-AMPLIFIER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	☆116 ○116A Figs. 5-68 5-72 5-73 Table 5-6	Connect multimeter between chassis and feedthrough capacitors. Select the 200 vdc range, tolerance ±20%.	C1125: +170 vdc	If indication is abnormal, refer to table 5-6. Check C1125. WARNING Turn off power before making ohmmeter measurements.
2	☆118 ○118A ○118B Figs. 5-68 5-70 5-72 5-73	Disconnect plugs P1101, P1102, and P1103 from J1101, J1102, and J1103. Connect signal generator to J1103 through a .01 uf capacitor and adjust for an 81 kc output (180 uv). Set the RF GAIN control fully clockwise. Measure the signal at test points with VTVM ME-30/U. NOTE: RECEPTION switch must be in SSB position for all steps.	V1106 pin 1: 1.0 mv (minimum)	If indication is abnormal, replace V1105. Check socket pin voltages given in table 6-9. Check FL1101, C1122, C1126, and C1127. Refer to Section 6 for GAIN BAL (R1128) adjustment.
	☆119 ○119A		V1107 pin 1: 9.0 mv (minimum)	If indication is abnormal, replace V1106. Check socket pin voltages. Check T1102, C1129, and C1130.
3	☆124 ○127A Figs. 5-70 5-71 5-72 5-73	With signal generator at J1103 as described in step 2, set the AF LEVEL LINE B control fully clockwise and measure at test points with VTVM ME-30/U.	V1108 pin 1: 60 mv (minimum)	If indication is abnormal, replace V1107. Check socket pin voltages. Check R1136 and R1137. If still abnormal, perform step 4.
4	☆125 Figs. 5-70 5-72 5-73	Connect P1102 with J1102 and measure 80 kc carrier signal at Z1101. Use VTVM ME-30/U.	Z1101 terminal CAR: 2.5 v rms (approx)	If indication is abnormal, perform step 5; otherwise proceed to step 6. Replace V1104. Check socket pin voltages. Check C1119, C1116, and R1123.

TABLE 5-17. LSB DETECTOR-AMPLIFIER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5	126 Figs. 5-70 5-72 5-73	Measure 80 kc carrier signal at junction of R1118 and C1116. Use VTVM ME-30/U.	Junction R1118 and C1116: 1.0 to 1.5 vac	Check connectors of cable W652. Refer to table 5-16.
6	127 Figs. 5-71 5-72 5-73 139 Figs. 5-77 5-78 5-79	With signal generator at J1103 as described in step 2, set AF LEVEL LINE B fully clockwise and measure signal at test points with VTVM ME-30/U.	V1109 pin 1 or 7: 1.25 v rms (minimum)	If indication is abnormal, replace V1108. Check socket pin voltages. Check C1137, and R1143.
			J1803: 1.9 v rms (minimum); LINE B (600 ohm load connected). Refer to figure 5-77.	If indication is abnormal, replace V1109 with new tube. Check socket pin voltages. Check T1103 and output connections at TB1101.
7	120 120A 122	To test AGC amplifier circuit, connect the signal generator to J1103 as described in step 2. Place the AGC LOWER switch in ON position and measure the signal at test points with VTVM ME-30/U. Use VTVM for dc measurements.	T1101 terminal 3: 6 v rms (minimum)	If indication is abnormal, replace V1101, check socket pin voltages. Check T1101 and C1103.
	122A Figs. 5-69 5-72 5-73		Junction CR1102 and C1110: −6 vdc (minimum)	If indication is abnormal, check diode CR1102 and C1110, R1107, R1136, and R1138.
8	122 122B Figs. 5-69 5-72 5-73	To test the AGC voltage doubler circuit (V1102A), place the LOWER AGC switch in the ON position. Increase output of the RF generator to 100 uv and note the increase in AGC voltage at the junction of CR1102 and C1110.	Junction of CR1102 and C1110: −8 vdc (minimum)	If indication is abnormal, replace V1102. Check socket pin voltages.

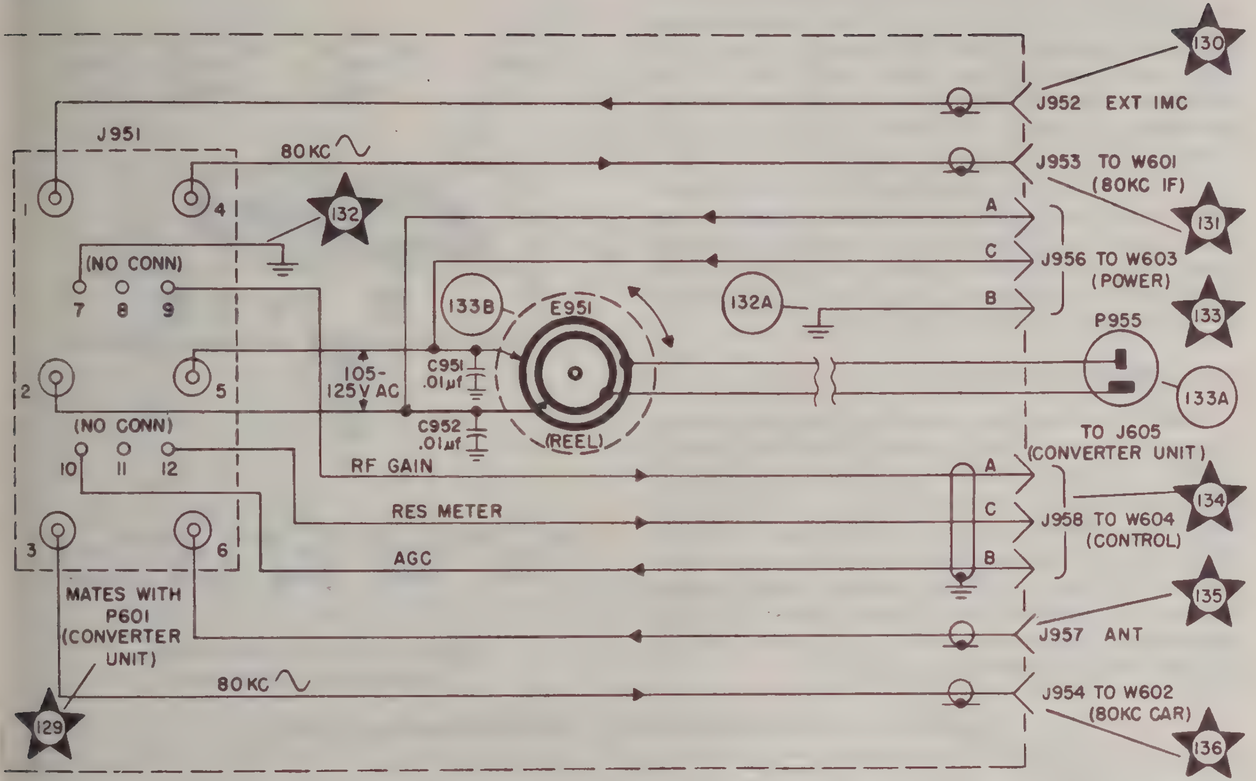

J951
80 KC
(NO CONN)
7
8
9
1
4
2
5
(NO CONN)
10
11
12
3
6
MATES WITH
P601
(CONVERTER
UNIT)
105-
125V AC
C951
.01µf
C952
.01µf
E951
(REEL)
133B
132A
132
RF GAIN
RES METER
AGC
80 KC
A
C
B
A
C
B
J952 EXT IMC
J953 TO W601
(80KC IF)
J956 TO W603
(POWER)
P955
133A
TO J605
(CONVERTER UNIT)
J958 TO W604
(CONTROL)
J957 ANT
J954 TO W602
(80KC CAR)
129
130
131
133
134
135
136

Figure 5-74. Converter Blister, Functional Schematic Diagram

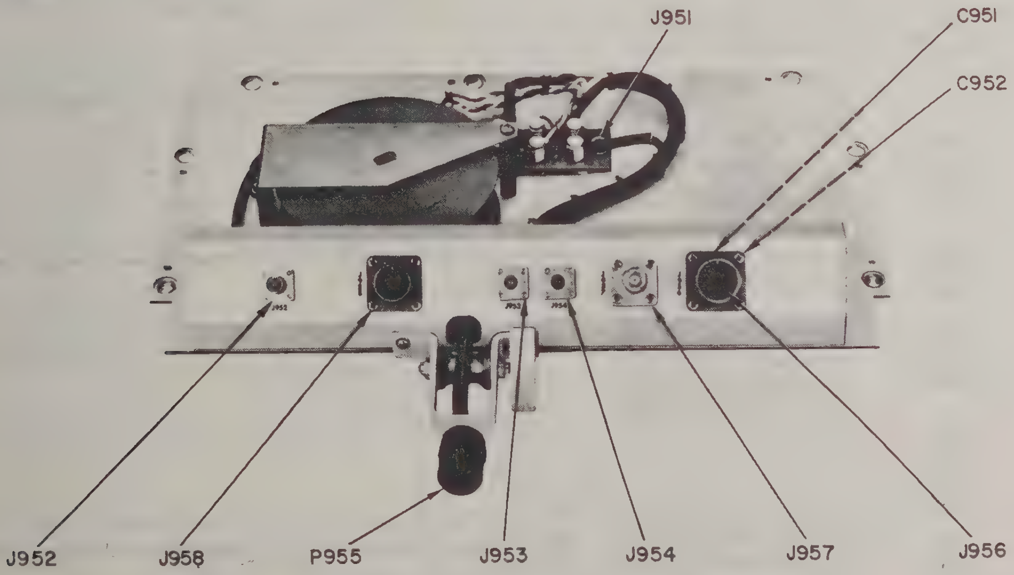

J951
C951
C952
J952
J958
P955
J953
J954
J957
J956

Figure 5-75. Converter Blister, Location of Parts

f. DEMODULATOR BLISTER TROUBLE-SHOOTING CHART.—Table 5-19 is the trouble-shooting chart for the demodulator blister. Perform the steps in the order given, compare the results with those in the NORMAL INDICATION column, and follow the instructions given in the NEXT STEP column. Figure 5-79 shows the location of test points.

Use the lowest resistance range on the multimeter to check circuit continuity and the highest range to find shorts or high-resistance leakage between normally open circuits. Make all measurements between individual contacts of connector P1801 and the related cable connection on the outside of the blister.

5-24. TYPICAL TROUBLES.

Table 5-20 lists typical troubles which may occur during operation of the receiver. The troubles are listed in the order of their likelihood of occurrence, pending receipt of information based on field experience. Figure 5-80 shows the circuit location of chassis test points (tip jacks). Other test points are not indicated. Signal paths may be selected and measurements made at test points to verify circuit operation. When measuring at test points, refer to the trouble-shooting chart for the subassembly being tested.

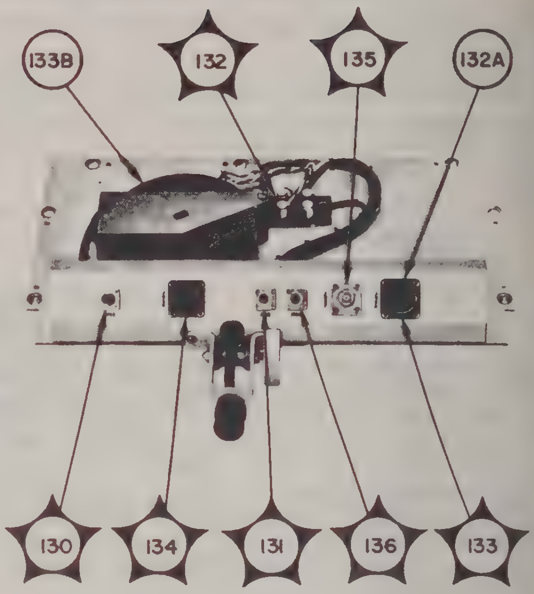


Figure 5-76. Converter Blister, Location of Test Points

TABLE 5-18. CONVERTER BLISTER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	129 130	With the multimeter at appropriate ohmic range, check the circuits continuity between terminal 1 of connectors J601 on patch cable and J952.	J601 terminal 1 to J952: 0 ohms	If indication is abnormal, check patch cable. Remove blister and repair circuit. See Section 6 for removal instructions.
	Figs. 5-74 5-75 5-76	Check for short circuit or leakage between terminal 1 of J601 and terminals 2 through 12 of J601 (excluding terminals 8 and 11).	J601 terminal 1 to remaining terminals of J601: infinity	If indication is abnormal, see step 1
2	129	Check circuit continuity from terminal 4 of J601 to J953.	J601 terminal 4 to J953: 0 ohms	If indication is abnormal, see step 1.
	131 Figs. 5-74 5-75 5-76	Check for short circuit from terminal 4 of J601 to remaining terminals (5, 6, 7, 9, 2, 3, 10, and 12).	J601 terminal 4 to remaining terminals of J601: infinity	If indication is abnormal, see step 1.
3	132	Check circuit continuity from terminal 7 of J601 to blister chassis.	J601 terminal 7 to chassis: 0 ohms	If indication is abnormal, see step 1.
	Figs. 5-74 5-75 5-76	Check for short circuit from terminal 7 of J601 to remaining terminals (5, 6, 9, 2, 3, 10, and 12).	J601 terminal 7 to remaining terminals: infinity	If indication is abnormal, see step 1.

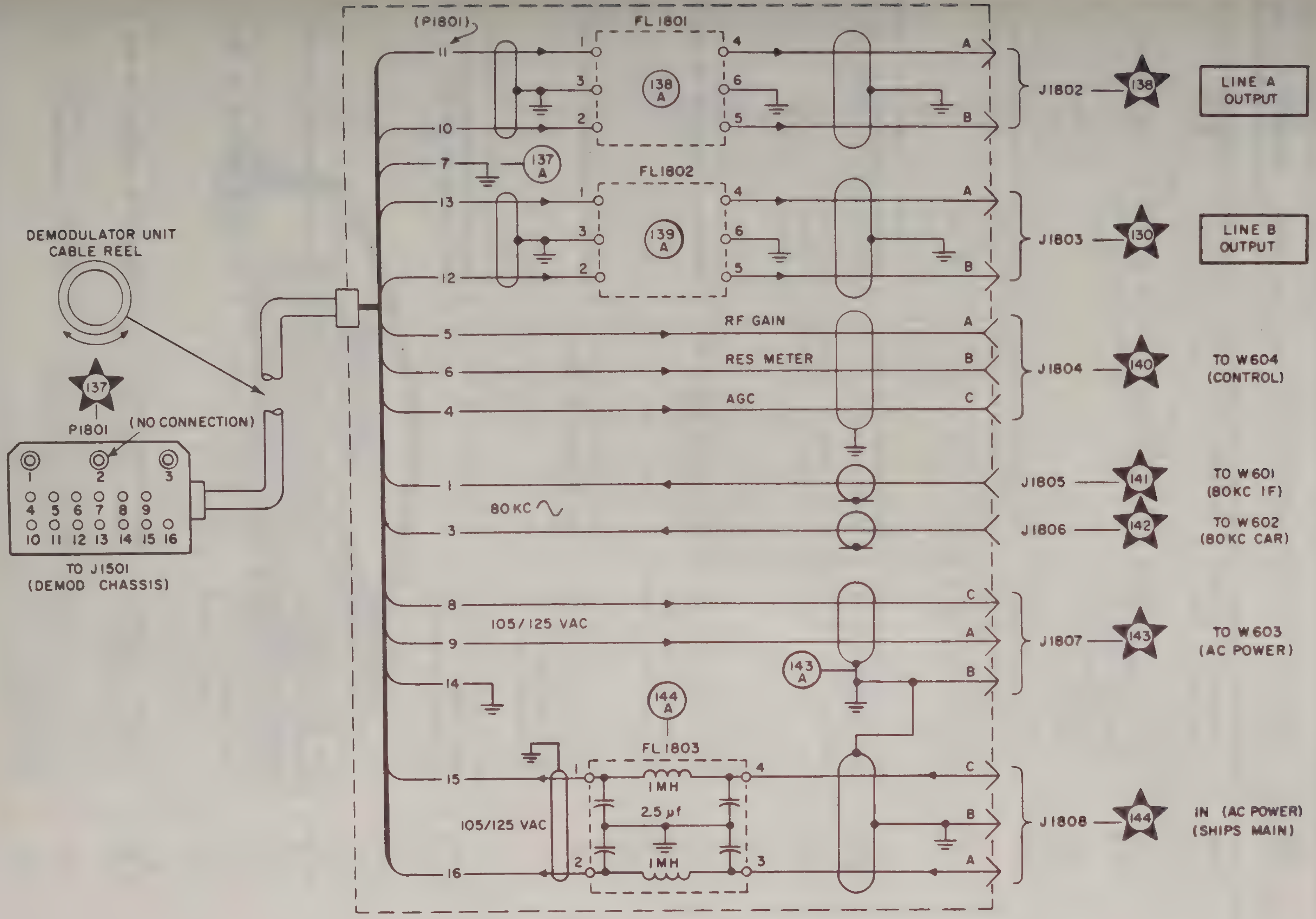

(P1801)
FL 1801
138 A
FL1802
139 A
137 A
11
10
7
13
12
5
6
4
1
3
8
9
14
15
16
1
2
3
4
5
6
A
B
C
J1802
J1803
J1804
J1805
J1806
J1807
J1808
138
130
140
141
142
143
144
LINE A OUTPUT
LINE B OUTPUT
TO W604 (CONTROL)
TO W601 (80KC IF)
TO W602 (80KC CAR)
TO W603 (AC POWER)
IN (AC POWER) (SHIPS MAIN)
RF GAIN
RES METER
AGC
80 KC ∿
105/125 VAC
143 A
144 A
FL 1803
1MH
2.5 μf
105/125 VAC
DEMODULATOR UNIT CABLE REEL
137
P1801
(NO CONNECTION)
1 2 3
4 5 6 7 8 9
10 11 12 13 14 15 16
TO J1501 (DEMOD CHASSIS)

Figure 5-77. Demodulator Blister, Functional Schematic Diagram

TABLE 5-18. CONVERTER BLISTER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4	132A	Check circuit continuity from terminal 7 of J601 to terminal B of J956.	J601 terminal 7 to terminal B of J956: 0 ohms	If indication is abnormal, see step 1.
5	133 Figs. 5-74 5-75 5-76	Check circuit continuity from terminal 5 of J601 to terminal C of J956 (ac power connector P955 to be detached from J605 for this test).	J601 terminal 5 to terminal A of J956: 0 ohms	If indication is abnormal, see step 1.
		Check for short circuit from terminal 5 of J601 to remaining terminals (6, 9, 2, 3, 10, 12), with P955 removed from J605.	J605 terminal 5 to remaining terminals of J601: infinity	If indication is abnormal, see step 1.
6	129 Figs. 5-74 5-75 5-76	Check circuit continuity from terminal 5 of J601 to associated terminal P955.	J601 terminal 5 to P955: 0 ohms	If indication is abnormal, see step 1. Check contacts on reel E951.
7	133 Figs. 5-74 5-75 5-76	Check circuit continuity from terminal 2 of J601 to terminal A of J956. (P955 removed from J605.)	J601 terminal 2 to terminal A of J956: 0 ohms	If indication is abnormal, see step 1.
		Check for short circuit from terminal 2 of J601 to remaining terminals (6, 9, 3, 10, and 12). P955 removed from J605.	J601 terminal 2 to remaining terminals of J601: infinity	If indication is abnormal, see step 1.
8	133A 133B	Check circuit continuity from terminal 2 of J601 to associated terminal on P955.	J601 terminal 2 to P955: 0 ohms	If indication is abnormal, see step 1. Check contacts on reel E951.
9	134 Figs. 5-74 5-75 5-76	Check circuit continuity from terminal 9 of J601 to terminal A of J958.	J601 terminal 9 to terminal A of J958: 0 ohms	If indication is abnormal, see step 1.
		Check for short circuit from terminal 9 of J601 to remaining terminals (6, 3, 10, and 12).	J601 terminal 9 to remaining terminals of J601: infinity	If indication is abnormal, see step 1.
10	134 Figs. 5-74 5-75 5-76	Check circuit continuity from terminal 12 of J601 to terminal C of J958.	J601 terminal 12 to terminal C of J958: 0 ohms	If indication is abnormal, see step 1.
		Check for short circuit from terminal 12 of J651 to remaining terminals (6, 3, and 10).	J601 terminal 12 to remaining terminals: infinity	If indication is abnormal, see step 1.

TABLE 5-18. CONVERTER BLISTER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
11	134 Figs. 5-74 5-75 5-76	Check circuit continuity from terminal 10 of J601 to terminal B of J958.	J601 terminal 10 to terminal B of J958: 0 ohms	If indication is abnormal, see step 1.
		Check for short circuit from terminal 10 of J601 to remaining terminals (6 and 3).	J601 terminal 10 to remaining terminals: infinity	If indication is abnormal, see step 1.
12	135 Figs. 5-74 5-75 5-76	Check circuit continuity from terminal 6 of J601 to J957.	J601 terminal 6 to J957: 0 ohms	If indication is abnormal, see step 1.
		Check for short circuit from terminal 6 of J601 to remaining terminal (3).	J601 terminal 6 to remaining terminal (3): infinity	If indication is abnormal, see step 1.
13	136 Figs. 5-74 5-75 5-76	Check circuit continuity from terminal 3 of J601 to J954.	J601 terminal 3 to J954: 0 ohms	If indication is abnormal, see step 1.

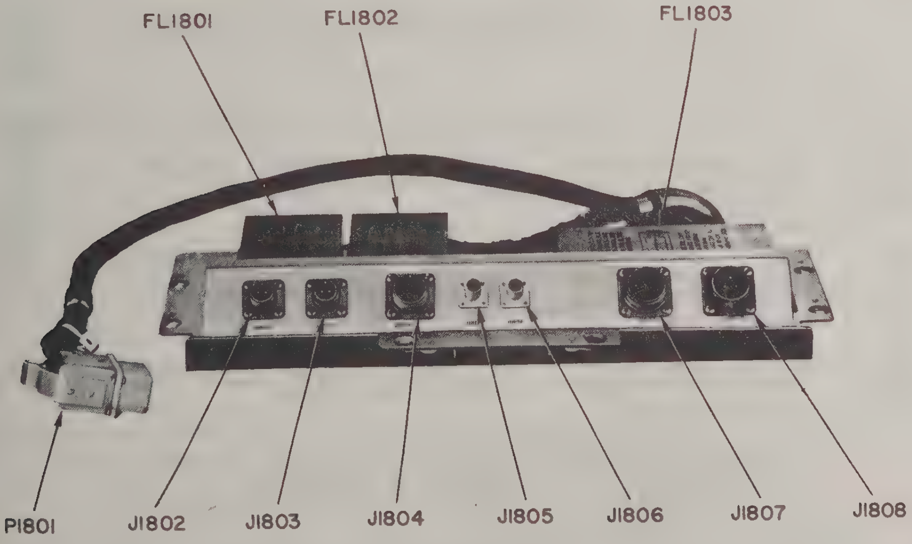


Figure 5-78. Demodulator Blister, Location of Parts

TABLE 5-19. DEMODULATOR BLISTER, TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	137 138 Figs. 5-77 5-78 5-79	With the multimeter at the appropriate ohms range, check continuity from terminal 11 of P1801 to terminal A of J1802.	P1801 terminal 11 to terminal A J1802: 0.1 ohms	If indication is abnormal, remove blister and test FL1801. Check circuit wiring. See par. 6-5*c*(6) for removal instructions.
		Check continuity from terminal 10 of P1801 to terminal B of J1802.	P1801 terminal 10 to terminal B J1802: 0.1 ohms	See step 1.
		Check for short circuit between terminals 11 and 10 of P1801.	P1801, terminals 11 and 10: infinity	See step 1.
		Check for short circuit between terminals A and B of J1802.	J1802, terminals A and B: infinity	See step 1.
2	137A	Check continuity from terminal 14 of P1801 to blister chassis.	P1801, terminal 14 to chassis: 0 ohms	If indication is abnormal, remove blister and check wiring.
3	137 139 Figs. 5-77 5-78 5-79	Check continuity from terminal 13 of P1801 to terminal A of J1803.	P1801 terminal 13 to terminal A of J1803: 0.1 ohms	If indication is abnormal, remove blister and test FL1802. Check circuit wiring.
		Check continuity from terminal 12 of P1801 to terminal B of J1803.	P1801 terminal 12 to terminal B of J1803: 0.1 ohms	See step 2.
		Check for short circuit between terminals 13 and 12 of P1801.	P1801, terminals 13 and 12: infinity	See step 2.
		Check for short circuit between terminals A and B of J1803.	J1803, terminals A and B: infinity	See step 2.
4	137 140 Figs. 5-77 5-78 5-79	Check continuity from terminal 5 of P1801 to terminal A of J1804.	P1801 terminal 5 to terminal A of J1804: 0 ohms	See step 2.
		Check for short circuit between terminal 5 of P1801 and all other terminals of P1801.	P1801 terminal 5 to all other terminals of P1801: infinity	See step 2.
		Check continuity from terminal 6 of P1801 to terminal B of J1804.	P1801 terminal 6 to terminal B of J1804: 0 ohms	See step 2.
		Check for short circuit between terminal 6 of P1801 remaining terminals (1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16).	P1801 terminal 6 to all remaining terminals: infinity	See step 2.
		Check continuity from terminal 4 of P1801 to terminal C of J1804.	P1801 terminal 4 to terminal C of J1804: 0 ohms	See step 2.

TABLE 5-19. DEMODULATOR BLISTER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
		Check for short circuit between terminal 4 of P1801 and remaining terminals (1, 3, 8, 9, 10, 11, 12, 13, 14, 15, 16).	P1801 terminal 4 to all remaining terminals: infinity	See step 2.
5	137 141 Figs. 5-77 5-78 5-79	Check continuity from terminal 1 of P1801 to J1805.	P1801 terminal 1 to J1805: 0 ohms	See step 2.
		Check for short circuit between terminal 1 of P1801 and remaining terminals (3, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16).	P1801 terminal 1 to remaining terminals: infinity	See step 2.
6	142	Check continuity from terminal 3 of P1801 to J1806.	P1801 terminal 3 to J1806: 0 ohms	See step 2.
7	137 Figs. 5-77 5-78 5-79	Check for short circuit between terminal 3 of P1801 and remaining terminals (7, 8, 9, 10, 11, 12, 13, 14, 15, and 16).	P1801 terminal 3 to remaining terminals: infinity	See step 2.
8	137 143 Figs. 5-77 5-78 5-79	Check continuity from terminal 8 of P1801 to terminal A of J1807.	P1801 terminal 8 to terminal A of J1807: 0 ohms	See step 2.
		Check for short circuit between terminal 8 of P1801 and remaining terminals (7, 9, 10, 12, 11, 13, 14, 15, and 16).	P1801 terminal 8 to remaining terminals: infinity	See step 2.
		Check continuity from terminal 9 of P1801 to terminal C of J1807.	P1801 terminal 9 to terminal C of J1807: 0 ohms	See step 2.
		Check for short circuit between terminal 9 of P1801 and remaining terminals (7, 10, 11, 12, 13, 14, 15, and 16).	P1801 terminal 9 to remaining terminals: infinity.	See step 2.
		Check for continuity between terminal B of J1807 and blister chassis.	J1807 terminal B to chassis: 0 ohms.	See step 2.
		Check for short circuit between blister chassis and all P1801 terminals.	Blister chassis to all P1801 terminals: infinity except 14 which should indicate 0 ohms.	See step 2.

TABLE 5-19. DEMODULATOR BLISTER, TROUBLE-SHOOTING CHART (cont)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
9	137	Check continuity from terminal 15 of P1801 to terminal A of J1808.	P1801 terminal 15 to terminal A of J1808: 0.02 ohms.	If indication is abnormal, remove blister and test FL1803. Check circuit wiring.
	144	Check continuity from terminal 16 of P1801 to terminal C of J1808.	P1801 terminal 16 to terminal C of J1808: 0.02 ohms.	See above.
	Figs. 5-77 5-78 5-79	Check for short circuit between terminals 15 and 16 of P1801.	P1801 terminal 15 to 16: infinity.	If indication is abnormal, remove blister and test FL1803. Check circuit wiring.
		Check continuity from terminal B of J1808 to blister chassis.	J1808 terminal B to chassis: 0 ohms.	See above.

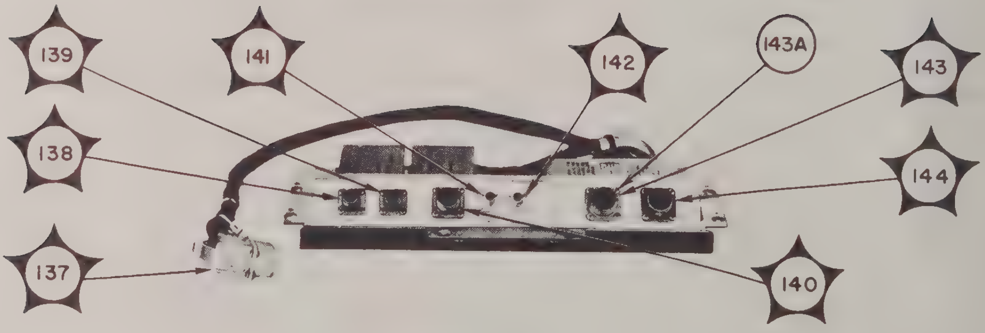


Figure 5-79. Demodulator Blister, Location of Test Points

TABLE 5-20. RADIO RECEIVING SETS AN/WRR-2 AND AN/FRR-59, TYPICAL TROUBLES

SYMPTOM	REMEDY PROBABLE CAUSE	REMEDY PROBABLE CAUSE
No reception with ANT. CPLG. switch in the NOR. position.	Blown fuse in antenna coupling subassembly	Replace fuse F2801 with SPARE fuse.
Blower BL651 does not operate.	1. Switch S651 is open and temperature in cabinet is below 112°F, the point at which thermostat switch S651 closes to operate blower. 2. Blower circuit fuse F652 is blown. 3. Blower thermostat switch S651 is defective.	None. Replace F652 with SPARE fuse. Replace thermostat switch S651. See figure 5-1.
PHASE OR TEMP. meter M602 does not indicate.	Defective oven-oscillator tube	Check tubes V701, V702, and V703 and replace defective tube. See table 5-14.
BFO does not function normally.	Defective BFO tube or voltage-regulator tube	Check tubes V1610 and V1611 and replace defective tube. See table 5-9.
AM reception but no SSB reception.	Defective carrier-amplifier tube	Check tube V1104 and replace if necessary. See table 5-17.
AM reception but signal is distorted and RESONANCE meter M601 does not indicate.	Defective AGC amplifier tube in AM detector-amplifier	Check tube V1605 and replace if necessary. See table 5-17.
No reception; TUNING meters (100 KC and 0.5 KC) do not indicate when receiver is tuned to an incremental frequency.	Defective HF oscillator tube or defective tube in frequency divider.	Check tubes V301, V451, V452, and V453 and replace those defective. See tables 5-10 and 5-15.
SSB reception but no AM reception.	Defective tube in AM detector-amplifier	Check tubes V1601 through V1609 and replace. See table 5-9.
No reception; 0.5 KC TUNING meter does not indicate when receiver is tuned to an incremental frequency.	Defective interpolator oscillator tube	Check tube V401 and replace if faulty. See table 5-12.
AM reception but no SSB reception.	Defective IF amplifier tube in USB detector-amplifier (this tube common to both USB and LSB detector-amplifiers)	Check V1003. See table 5-13.
Incremental tuning meters drift requiring frequent adjustment of TUNING controls. Output meters not affected.	Intermittent or defective voltage-regulator tubes in converter power supply	Check V901, V902, and V903 in the converter power supply. See table 5-5.
Reception normal but AM detector-amplifier silencer circuit does not operate.	Defective AM silencer tube	Check V1608. See table 5-9.
When crystal oscillator is calibrated with external frequency standard, required correction can not be made; INT. STD. counter is at end of scale.	Normal change in frequency of crystal Y1 over long period has exceeded correction range of INT. STD. trimmer	Connect capacitor C746 in parallel with C716 in crystal oscillator circuit. See figure 5-53 and table 5-14.
Receiver does not operate; all panel meters, including PHASE OR TEMP., inoperative.	Defective tube in crystal oscillator or frequency divider of crystal oscillator	Check tubes V704 through V709. See table 5-14.

331-95 [illegible]

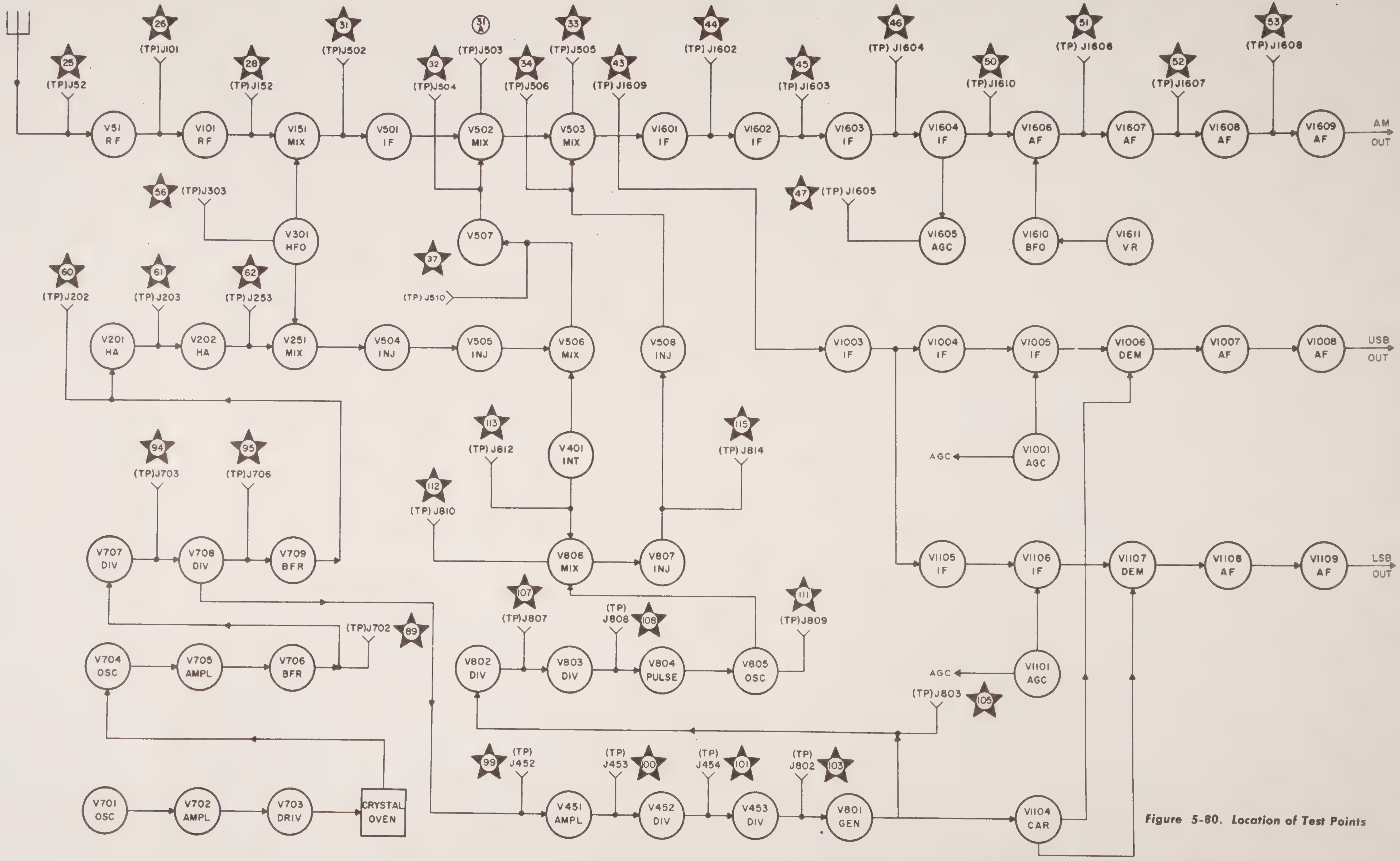

25
(TP)J52
26
(TP)J101
28
(TP)J152
31
(TP)J502
32
(TP)J504
31A
(TP)J503
34
(TP)J506
33
(TP)J505
43
(TP) J1609
44
(TP) J1602
45
(TP) J1603
46
(TP) J1604
50
(TP) J1610
51
(TP) J1606
52
(TP) J1607
53
(TP) J1608
V51
RF
V101
RF
V151
MIX
V501
IF
V502
MIX
V503
MIX
V1601
IF
V1602
IF
V1603
IF
V1604
IF
V1606
AF
V1607
AF
V1608
AF
V1609
AF
AM
OUT
56
(TP)J303
V301
HFO
V507
37
(TP) J510
47
(TP) J1605
V1605
AGC
V1610
BFO
V1611
VR
60
(TP)J202
61
(TP)J203
62
(TP)J253
V201
HA
V202
HA
V251
MIX
V504
INJ
V505
INJ
V506
MIX
V508
INJ
V1003
IF
V1004
IF
V1005
IF
V1006
DEM
V1007
AF
V1008
AF
USB
OUT
113
(TP) J812
V401
INT
115
(TP) J814
AGC
V1001
AGC
94
(TP)J703
95
(TP)J706
112
(TP) J810
V707
DIV
V708
DIV
V709
BFR
V806
MIX
V807
INJ
V1105
IF
V1106
IF
V1107
DEM
V1108
AF
V1109
AF
LSB
OUT
107
(TP)J807
(TP)
J808
108
111
(TP)J809
(TP)J702
89
V704
OSC
V705
AMPL
V706
BFR
V802
DIV
V803
DIV
V804
PULSE
V805
OSC
AGC
V1101
AGC
(TP)J803
105
99
(TP)
J452
(TP)
J453
100
(TP)
J454
101
(TP)
J802
103
V701
OSC
V702
AMPL
V703
DRIV
CRYSTAL
OVEN
V451
AMPL
V452
DIV
V453
DIV
V801
GEN
V1104
CAR

Figure 5-80. Location of Test Points

SECTION 6
REPAIR

6-1. FAILURE REPORT.

Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use ELECTRONIC FAILURE REPORT form DD787. Each pad of the forms includes full instructions for filling out the forms and forwarding them to the Bureau of Ships. However, the importance of providing complete information cannot be emphasized too much. Be sure that you include the model designation and serial number of the equipment (from the equipment identification plate), the type number and serial number of the major unit (from the major unit identification plate), and the type number and reference designation of the particular defective part (from the technical manual). Describe the cause of the failure completely, continuing on the back of the form if necessary. Do not substitute brevity for clarity. And remember—there are two sides to the failure report—

"YOUR SIDE"

Every FAILURE REPORT is a boost for you:
1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

"BUREAU SIDE"

The Bureau of Ships uses the information to:
1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.
5. Publish maintenance data.

Always keep a supply of failure report forms on board. You can get them from the nearest Forms and Publications Supply Point.

6-2. TUNING AND ADJUSTMENT.

a. GENERAL.—The following paragraphs contain information on tuning and adjustment procedures required to ensure performance standards to be expected of the receiver. Coverage includes test equipment and special tools, control settings, test setups, connections, instructions, and performance standards. Procedures involving Electronics Frequency Converter CV-920A/URR (converter) are discussed first, followed by those involving Intermediate Frequency-Audio Frequency Amplifier AM-2477A/URR (demodulator).

b. ADJUSTMENTS.—Proper alignment of the circuits in the receiver depends on careful adjustment of controls for maximum output response to input signals within originally specified bandwidths. This requires, among other things, a high-quality signal generator, calibrated accurately with an external frequency standard. The strength of test signals required is determined by test conditions. Circuits requiring only small adjustments will indicate proper responses with only nominal input levels; those appreciably out of adjustment will require correspondingly larger inputs. The following alignment instructions are based on the assumption that the circuits are properly tuned, requiring nominal inputs.

c. PREREQUISITES.—Certain other assumptions must also be made in connection with alignment adjustments. These are that:

(1) The receiver is connected to an ac line.

(2) Both converter and demodulator power supplies are on and delivering rated voltages.

(3) Except for misalignments under test, the receiver is working properly.

(4) The receiver has been warmed up for at least an hour and is at proper operating temperature.

(5) The output of Signal Generator AN/URM-25D (see item no. 1 of table 6-1 below) is properly terminated with a 50-ohm termination. This ensures a voltage output from the generator consistent with the voltage indication on the generator's self-contained meter.

(6) All indications on LINE A OUTPUT and LINE B OUTPUT meters on the front panel of the demodulator drawer are obtained with a 600-ohm load termination at the secondary terminals of audio output transformers T1004 and T1103 (see figure 6-19).

d. TEST EQUIPMENT AND SPECIAL TOOLS.—Table 6-1 lists equipment needed for most tests and tuning adjustments. Special tools are not required.

e. PRELIMINARY CONTROL SETTINGS.—Table 6-2 lists the panel controls of the receiver, their location, and their settings preliminary to alignment procedures. Any exceptions to these settings will be noted in the subparagraphs covering specific tests.

6-3. CONVERTER.

The following subparagraphs contain instructions for adjustment and alignment of converter subassemblies. These procedures are performed with the drawer extended and the upper deck tilted to provide access to its top and bottom sections. Opening the drawer breaks

TABLE 6-1. TEST EQUIPMENT FOR TUNING AND ADJUSTMENT

ITEM NO.	NOMENCLATURE	CHARACTERISTICS	APPLICATION
1	Signal Generator AN/URM-25D	10 kc to 50 mc; output, 0.1 uv to 0.1 v; mod, 400 or 1,000 cps	For alignment procedures
2	Audio Oscillator AN/URM-127	20 to 200,000 cps ±2%; output 1 uv to 10 v	For audio test signal
3	Electronic Multimeter ME-6E/U series	0 to 1,000 v ac-dc; 0 to 1,000 ma dc; 0 to 1,000 megohms	For troubleshooting and maintenance
4	Oscilloscope OS-8E/U series	Sensitivity 0.1 v (RMS)/in.; response ±3 db from 5 cps to 2 mc	For waveshape analysis
5	Multimeter AN/PSM-4C	0 to 4,000 vdc, 0 to 1,000 vac; 0 to 10 a dc; 0 to 100 megohms	For general service tests
6	Patch Cable W624		To connect converter and its blister when drawer is open
7	External Frequency Standard AN/URQ-9	Accurate to 1 part in 10^8 or better	For precise adjustment of crystal oscillator
8	Electronic Counter AN/USM-26 (with auxiliary video amplifier)		For frequency adjustments
9	.01 mf capacitor		
10	22 K resistor		
11	Phones	600 ohms	

power contact at the rear. To re-establish contact, connect patch cable W624 between P601 on the rear of the drawer and J951 on the converter blister.

CAUTION

> Before opening the converter drawer all the way, make certain that the receiver is secure in its mounting cradle and that the cradle is bolted to a table. Otherwise, the weight of the extended drawer will tip over the receiver.

a. CRYSTAL OSCILLATOR.

(1) ADJUSTMENT.

(a) Connect the external frequency standard (1 mc) to connector J709 (figure 5-55).

(b) Hold INT. STD. PHASE/TEMP. switch S602 in PHASE position.

(c) Adjust INTERNAL STANDARD ADJUSTMENT control until the oscillation of the PHASE OR TEMP. meter becomes less than one beat in 10 seconds.

Note

> If this result is not obtained, connect C746 in parallel with C716. If the result is still not obtained, increase the value of C716 within the given limits until the condition described in this step is satisfied.

(d) Return switch S602 to TEMP.

(2) ALIGNMENT.—Alignment of the crystal oscillator section includes the adjustment of coils L704 of 1 mc amplifier stage V705, L705 of 1 mc to 500 kc divider stage V707, L706 of 500-to-100 kc divider stage V708, and L707 of 100 kc buffer stage V709. The last adjustment involves test point TP J202 OF HARMONIC AMPLIFIER STAGE V201, located in the lower converter deck (figure 5-39).

(a) Connect the electronic multimeter (using the diode probe) to pin 5 of V706, with the multimeter set to the 10 volt scale.

(b) Adjust L704 (figure 5-55) for a maximum indication on the electronic multimeter.

(c) Remove cover plate from crystal oscillator subassembly.

(d) Connect Y INPUT (VERTICAL) of the oscilloscope between test point TP J702 and ground. (Hold INT. STD. PHASE/TEMP. switch in PHASE position.)

(e) Connect X INPUT (HORIZONTAL) of the oscilloscope between test point TP J703 and ground.

(f) Adjust L705 until a two-to-one Lissajous pattern appears on the oscilloscope screen.

(g) Readjust L705 until its setting is in the center of the range of the two-to-one pattern, centering by approximation.

(h) Remove Y INPUT (VERTICAL) of the oscilloscope from test point TP J702 and connect it to test point TP J706.

(i) With X INPUT (HORIZONTAL) still connected to test point TP J703, adjust L706 until a five-to-one Lissajous pattern appears on the oscilloscope screen.

TABLE 6-2. PRELIMINARY CONTROL SETTINGS

CONTROL	LOCATION	SETTING
POWER ON/OFF	Lower demodulator panel	ON
RECEPTION A.M./S.S.B.	Lower demodulator panel	A.M.
O.L. THRES.	Upper demodulator panel	OFF
A.M. A.F. LEVEL	Upper demodulator panel	0
A.M. A.G.C. TIME CONST.	Upper demodulator panel	MED.
R.F. SELECTIVITY BW-KCS	Upper demodulator panel	12.0
B.F.O.	Upper demodulator panel	OFF
VAR. B.F.O.	Upper demodulator panel	0
SILENCER	Upper demodulator panel	OFF
PHONE LEVEL	Lower demodulator panel	0
A.F. LEVEL LINE A	Lower demodulator panel	0
A.G.C. UPPER ON/S.S.B./OFF	Lower demodulator panel	OFF
A.G.C. UPPER SLOW/FAST	Lower demodulator panel	FAST
A.F. LEVEL LINE B	Lower demodulator panel	0
A.G.C. LOWER ON/S.S.B./OFF	Lower demodulator panel	OFF
A.G.C. LOWER SLOW/FAST	Lower demodulator panel	FAST
INT. STD. PHASE/TEMP.	Upper converter panel	TEMP.
INT. STD. LOG	Upper converter panel	Do Not Adjust
FREQ. STAND. EXT. STD./INT. STD.	Upper converter panel	INT. STD.
TUNING .5 KC/CONT.	Upper converter panel	.5 KC
TUNING $\Delta F = 100$KC (MEGACYCLE)	Lower converter panel	04.0
H.F. ADJ.	Lower converter panel	Center
BAND	Lower converter panel	4-8
TUNING (KILOCYCLE)	Lower converter panel	00.0
R.F. GAIN	Lower converter panel	10
ANT. CPLG.	Lower converter panel	NOR

Note

When using oscilloscope OS-8E/U to obtain Lissajous patterns, set the SYNC AMPLITUDE control to zero, and adjust the X GAIN (horizontal), Y GAIN (vertical), and VERT ATTEN controls to obtain convenient Lissajous pattern indications on the oscilloscope screen.

(j) Readjust L706 until its setting is in the center of the five-to-one pattern range, centering by approximation.

(k) Remove the oscilloscope lead connections from test points TP J703 and TP J706.

(l) Set Mc dial to 2 mc. Connect electronic multimeter (with diode probe) to test point TP J202 of harmonic amplifier stage V201, and set it to the 10 volt scale.

(m) Adjust L707 for a maximum indication on the electronic multimeter.

(n) Remove test equipment from test point TP J202 of the harmonic amplifier, and also remove patch cable W624.

b. FREQUENCY DIVIDER.—The adjustments for this section provide, in addition to establishing of proper frequency division, a means of securing maximum amplification from 100 kc amplifier V451 of the frequency divider.

(1) FREQUENCY-DIVIDING ADJUSTMENTS.

(a) Connect the Y INPUT (VERTICAL) of the oscilloscope to 100 kc test point TP J453 (figure 5-58).

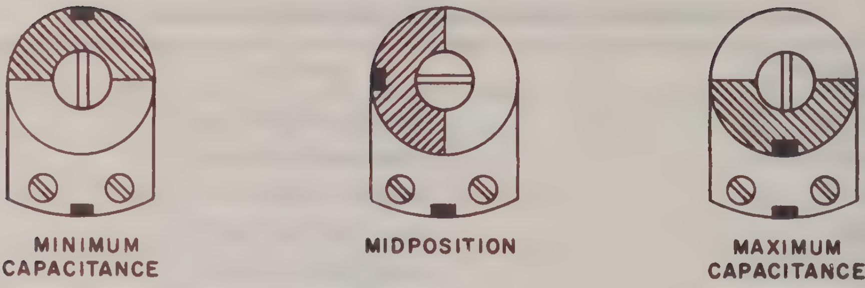


Figure 6-1. Physical Arrangement of Capacitor C461

(b) Connect the X INPUT (HORIZONTAL) of the oscilloscope to 20 kc test point TP J454.

(c) A five-to-one Lissajous pattern appears on the screen of the oscilloscope. If the pattern appears to move, adjust capacitor C461 until the pattern becomes stationary. Adjust C461 to the center of the stationary five-to-one pattern range.

(d) If the pattern remains stationary over the entire range of C461, set the capacitor to its midposition (figure 6-1).

(2) 100 KC AMPLIFIER.

(a) Remove oscilloscope from TP J453 and TP J454 and connect the electronic multimeter (with diode probe) between test point TP J453 (figure 5-58) and ground. Set the electronic multimeter to the 10 volt scale.

(b) Adjust L451 for maximum response on the electronic multimeter.

(c) Remove electronic multimeter from TP J453.

c. SYNTHESIZER.—There are five parts of the synthesizer subassembly, all requiring adjustment. They are: 140 kc, 80 kc, 20-to-5 kc divider, 5-to-0.5 kc divider, and 720-to-820 kc filter.

(1) 140 KC.

(a) Set TUNING switch S702 to CONT.

(b) Remove P801 from J801 and connect the signal generator in its place. Tune the signal generator to 140 kc using sufficient signal to provide adequate output indication on the .5 KC TUNING meter. Adjust the slugs of T802 for maximum dip on the .5 KC TUNING meter.

(c) Remove the signal generator and reconnect P801 to J801.

(d) Readjust slugs (top and bottom) of T802 for maximum dip on the .5 KC TUNING meter.

(e) Adjust L805 for maximum dip on the .5 KC TUNING meter.

(2) 80 KC.

(a) Connect the electronic multimeter (with diode probe) to test point TP J803. Set the electronic multimeter to the appropriate range.

(b) Remove P801 from J801 and connect the signal generator in its place. Adjust the generator for an output of 80 kc (approximately 20,000 uv).

(c) Adjust T803 for a maximum indication on the electronic multimeter by adjusting slugs above and below the chassis. Make sure that patch cable W624 is connected to ensure transfer of the 80 kc signal from the converter to amplifier V1104 in the demodulator.

(d) Remove the signal generator and reconnect P801 to J801 to provide 20 kc input signal.

(e) Readjust T803 slightly to return the electronic multimeter output indicator to maximum. T803 is now adjusted to exactly the fourth multiple of the 20 kc input signal.

(f) Remove the electronic multimeter from TP J803.

(3) 20 TO 5 KC DIVIDER.

(a) Connect Y INPUT (VERTICAL) of oscilloscope to test point TP J806.

(b) Connect X INPUT (HORIZONTAL) of oscilloscope to test point TP J807.

(c) With the oscilloscope connected as in steps *(a)* and *(b)*, a Lissajous pattern with a four-to-one ratio appears. If the pattern moves, adjust L802 until the pattern stops. Adjust L802 to the center of the stationary four-to-one pattern range.

(4) 5 to 1 KC DIVIDER.

(a) Remove Y INPUT (VERTICAL) of oscilloscope from test point TP J806 and connect it to test point TP J808. Allow X INPUT (HORIZONTAL) to remain connected to test point TP J807.

(b) The connections referred to in *(a)* establish a Lissajous pattern showing a one-to-ten ratio between circuits of divider stage V803 and the output section of V802.

(c) If the pattern appears to move, adjust the variable inductor of bandpass filter FL802 until the pattern stops. Adjust the variable inductor to the center of the stationary one-to-ten pattern range.

(d) Disconnect all test equipment.

(5) 720 TO 820 KC FILTER.

(a) Set KILOCYCLE counter to 50.0.

(b) Check that TUNING switch is in .5 KC position.

(c) Adjust capacitors C824 and C826 for maxinum dip on the ½ KC TUNING meter.

(d) Reset KILOCYCLE counter to 00.0. Remove patch cable W624.

d. INTERPOLATION OSCILLATOR.

(1) CONNECTIONS.

(a) Connect patch cable W624 between the converter and its blister.

(b) Connect the output of 1 mc crystal oscillator amplifier V705 and buffer stage V706 from test point TP J702 (figure 5-55) to test point TP J52 (figure 5-12) of the preselector 1st RF amplifier.

(c) Connect the audio oscillator TS-382/U to X INPUT (HORIZONTAL) of the oscilloscope.

(d) Connect LINE B PHONES output to Y INPUT (VERTICAL) of the oscilloscope.

(e) Remove P401 from J401 and connect Electronic Counter AN/USM-26 (with auxiliary video amplifier) to J401 (figure 5-42).

(2) CONTROL SETTINGS.

(a) Set BAND switch to 2-4.

(b) Set MEGACYCLE counter to 03.0.

(c) Set KILOCYCLE counter to 01.0.

(d) Set RECEPTION A.M./S.S.B. switch S657 to S.S.B.

(e) Set R.F. GAIN control R607 and A.F. LEVEL LINE B control R652 to establish a convenient indication on the oscilloscope (see (2)*(d)* below).

(3) PROCEDURES.—Adjustment of the interpolation oscillator can be accomplished by either of two alternative methods, depending on available equipment. The first approach requires an electronic counter whose frequency coverage includes the range between 580 and 680 kc, and which is sensitive enough to respond to a minimum input of 0.1 volt rms. The second method applies where an electronic counter is lacking, but an oscilloscope and audio oscillator are available.

(a) ADJUSTMENT WITH ELECTRONIC COUNTER.

1. Set sensitivity control of the electronic counter so that a 0.1 volt rms input will actuate it.

2. With KILOCYCLE counter set to +00.0 and C401 and C406 set to midrange, adjust L402 until the electronic counter reads 580 kc.

3. Reset KILOCYCLE counter to 00.0 and note the electronic counter frequency indication. If it reads 680 kc, adjustment is complete. If the reading differs from 680 kc, proceed with step *4.*

4. Adjust C406 for a reading of approximately 680 kc. When adjustment of C406 causes the frequency deviation to come within 100 cycles or less of the desired frequency deviation, complete the adjustment with C401.

5. Return KILOCYCLE counter to +00.0, and adjust L402 until the electronic counter reads 580 kc.

6. Reset KILOCYCLE counter to 00.0. If the electronic counter now reads 680 kc, adjustment is correct. If the reading differs from 680 kc, repeat steps *4* through *6* until the electronic counter indicates 680 kc at a KILOCYCLE counter setting of 00.0 and 580 kc at a KILOCYCLE counter setting of +00.0.

7. Remove the electronic counter input from J401 and reconnect P401 to J401.

(b) ADJUSTMENT WITH OSCILLOSCOPE AND AUDIO OSCILLATOR.—This procedure is divided into two parts—coarse alignment and fine alignment. If the interpolation oscillator is known to be only slightly out of alignment only the fine alignment procedure need be performed; otherwise, both coarse and fine alignment procedures should be performed.

1. COARSE ALIGNMENT.

(1) Place RECEPTION switch to A.M. position, BAND switch to 2-4 position, MEGACYCLE counter to 03.0, and the KILOCYCLE counter to 00.0.

(2) Connect 1 mc output from crystal oscillator at TP J702 to TP J52 of the preselector 1st RF amplifier. Connect phones to LINE A OUTPUT phones jack.

(3) Connect 80 kc carrier from synthesizer at TP J803 to TP J1609, the 80 kc input for the AM detector-amplifier. Remove P1601 from J1601.

(4) Place B.F.O. switch to ON position and adjust capacitor C1636 (labeled TUNE), which is accessible through the cover plate of the BFO assembly, for zero beat in the phones.

(5) Remove connection from TP J803 and TP J1609 and reconnect P1601 and J1601.

(6) Condition the receiver for A1 reception at 3 megacycles.

(7) Place B.F.O. switch to ON position and TUNING switch to CONT. position.

(8) Set MEGACYCLE counter to 02.9 and KILOCYCLE counter to +00.0. Set C401 and C406 to midrange positions and adjust L402 for a zero beat in the phones.

(9) Reset MEGACYCLE counter to 03.0 and KILOCYCLE counter to 00.0. Adjust C406 (coarse) and C401 (fine) for zero beat in the phones.

2. FINE ADJUSTMENT.—With TUNING switch S702 set to 0.5 KC, tune the receiver to a frequency 1 kc higher than that of the incoming signal (1 mc—see paragraph 6-3*d*(1), "Connections"). This causes a 1 kc signal to exist at the output of the receiver. If the interpolation oscillator is properly adjusted, then changing TUNING switch S702 from .5 KC to CONT. will not affect the frequency of the receiver output. By comparing output frequencies under the two TUNING switch settings, the need for adjustment of the interpolation oscillator can be determined. The following steps, outlining the adjustment procedure, also include settings of controls and connections noted in parts (1) and

(2) of paragraph 6-3*d;* the settings are repeated here to maintain continuity in establishing a 1 kc signal at the receiver output.

(1) Set RECEPTION switch S657 to S.S.B.

(2) Inject a 1 mc crystal-controlled signal from test point TP J702 (figure 5-55), to test point TP J52 (figure 5-12), at the input to the 1st RF amplifier V51.

(3) Set MEGACYCLE counter to 3 mc by tuning for a minimum reading on 100 KC TUNING meter M604.

(4) Set KILOCYCLE counter to 1 kc by tuning for a minimum reading on .5 KC TUNING meter M603.

Note

> A 1 kc signal is now available at the output of the LSB detector-amplifier.

(5) Connect LINE B PHONES output to Y INPUT (VERTICAL) of oscilloscope and audio oscillator output to X INPUT (HORIZONTAL) of oscilloscope. Adjust the audio oscillator output frequency until a circular pattern appears on the oscilloscope screen.

(6) Change TUNING switch S702 setting from .5 KC to CONT. and note the resulting screen pattern. If the interpolation oscillator is properly adjusted, the circular pattern will remain unchanged.

Note

> With continuous tuning, and with KILOCYCLE counter set to 01.0, a precise 1 kc reference signal can be obtained at the LSB output only when the interpolation oscillator adjustments establish a 1 kc output signal to correspond with the 01.0 reading on the KILOCYCLE counter. However, if the adjustments of the interpolation oscillator variable components do not represent a true 1 kc output frequency, then, even though the KILOCYCLE counter is set to 01.0, the output frequency is no longer 1 kc, and the Lissajous pattern on the oscilloscope screen is likewise no longer a circle. This indicates a need for corrective adjustment of the interpolation oscillator in accordance with the additional steps below.

(7) Set MEGACYCLE counter to 03.0 and KILOCYCLE counter to +01.0, and C401 at midrange. Tune L402 until a circular pattern appears.

(8) Set MEGACYCLE counter to 02.9 and KILOCYCLE counter in the vicinity of 01.0 until a circular pattern appears.

(9) Determine the kilocycle range between settings of steps *(7)* and *(8)*.

Note

> The range encompassed by settings of steps *(7)* and *(8)* should equal 100 kc. If the range covered differs from 100 kc, the error in kilocycles is found by determining the difference between the actual reading on the KILOCYCLE counter and +01.0. Compensation for this error is expedited by doubling the error setting on the KILOCYCLE counter. For example, if a circular pattern is obtained on the oscilloscope screen with a MEGACYCLE setting of 02.9 and a KILOCYCLE setting of +01.4, reset the KILOCYCLE counter to +01.8 prior to any further adjustment. If the error is in the opposite direction, with circular pattern appearing at a MEGACYCLE setting of 02.9 and a KILOCYCLE setting of +00.6, reset KILOCYCLE counter to +00.2. In either case proceed with step *(10)*.

(10) Adjust C406 until a circular pattern appears. When the error is reduced to 100 cycles or less, complete the adjustment with C401.

(11) Reset MEGACYCLE counter to 03.0 and KILOCYCLE counter to +00.0.

(12) Readjust L402 for a circular pattern.

(13) Reset MEGACYCLE counter to 02.9 and KILOCYCLE counter in the vicinity of +01.0 until a circular pattern appears. If this pattern occurs at +01.0 setting of the KILOCYCLE counter, adjustment is correct. If the setting on the KILOCYCLE counter for the circular pattern differs from +01.0, repeat above procedures, beginning with doubling of the error setting on the KILOCYCLE counter and continuing with steps *(10)* through *(13)*.

(14) Remove all test equipment and connections.

(15) Restore all controls to positions shown in table 6-2.

e. INJECTION IF AMPLIFIER.—Five components of this subassembly may require adjustment, namely, a 1625-1725 kc bandpass filter, and 825 kc amplifier, a 1455 kc center-frequency, a 100 kc bandpass section, a 220 kc filter, and a 140 kc filter, each of which is adjusted according to the following instructions:

(1) 1625-1725 KC BANDPASS FILTER.

(a) Remove P501 from J501 (figure 5-22) at input to amplifier stage V501.

(b) Connect signal generator to test point TP J502, and electronic multimeter with diode probe to test point TP J503. Set the signal generator output to 1675 kc (100 millivolts) and the electronic multimeter to the 1 volt scale through its diode probe.

(c) Adjust variable inductors of bandpass filter Z501 for maximum output indication on the electronic multimeter.

Note

> Since response from this filter is essentially flat over the range from 1625 to 1725 kc, check also for electronic multimeter output indication with the signal generator frequency set first at 1600 kc and then at 1750 kc, and

with the input to the filter at the same voltage as when adjusted for 1675 kc. When the coils are correctly adjusted, the electronic multimeter will read (at those edge frequencies) approximately 70 per cent of the voltage obtained at 1675 kc. Slight variations in the adjustments of step *(c)* are permissible to enable flat response over the 100 kc range specified, with a minimum of resulting loss in output due to these variations.

(d) Disconnect test equipment and reconnect P501 to J501.

(2) 825 KC AMPLIFIER.

(a) Remove cover plate from the bottom section of the injection IF amplifier.

(b) Disconnect the HF oscillator from the harmonic mixer by removing P251 of coax cable W610 from J251 of the harmonic mixer (figure 5-39).

(c) Connect signal generator to test point TP J253 of the harmonic mixer. Set the generator to a frequency of 825 kc and to an output voltage of 100 millivolts. Remove V506 to disable the AGC voltage.

(d) Connect electronic multimeter to terminal 1 of T501 (figure 5-22) through its diode probe, and set it to the 1 volt scale. Terminal 1 of T501 is reached by removal of the bottom plate referred to in step *(a)*.

(e) Adjust T501 for maximum output indication on the electronic multimeter. Access to this component is gained by removal of the bottom plate referred to in step *(a)*.

(f) Place probe at terminal 1 of T502. Adjust T502 for maximum output indication.

(g) Adjust capacitors C512 and C514 for maximum indication on the electronic multimeter. These capacitors are available for adjustment by means of access holes in the right side of the converter unit (looking into the receiver from the front). The lower deck may have to be tilted slightly to clear the holes from the supporting rail.

(h) Disconnect all test equipment, reconnect P251 to J251, and replace tube V506.

(i) Replace cover on the bottom of the injection amplifier.

(3) 1405-1505 KC FILTER.

(a) Remove P509 from J509 (at input to mixer stage V506 of the injection IF amplifier section).

(b) Connect signal generator to J509 and apply a 100 millivolt signal to this jack at 1455 kc.

(c) Connect electronic multimeter to test point TP J510 through its diode probe and set it to the 1 volt range.

(d) Adjust C520 and C524 for maximum indication of the electronic multimeter.

(e) Remove the electronic multimeter probe from test point TP J510 and connect it to test point TP J504. Reset the range of the electronic multimeter to 10 VOLTS.

(f) With the signal generator still at J509 and with frequency and voltage outputs the same as for step *(b)* adjust the slug-tuned coil of T503 for maximum indication on the electronic multimeter.

(g) Remove test equipment and reconnect P509 to J509.

(4) 220 KC FILTER.

(a) Disconnect P509 from J509.

(b) Connect signal generator to test point TP J503. Set the signal generator to 220 kc and for 0.1 volt output.

(c) Set the electronic multimeter to the 1 volt range. Connect electronic multimeter (with diode probe) to test point TP J505.

(d) Adjust capacitors C503 and C506 for maximum indication on the electronic multimeter.

(e) Remove test equipment. Reconnect P509 to J509.

(5) 140 KC FILTER.

(a) Remove P511 from J511 (at input to V508 of the injection IF amplifier section).

(b) Connect signal generator to J511 through a .01 mf capacitor. Set the signal generator to 140 kc and for 100 millivolts output.

(c) Connect electronic multimeter through its diode probe to test point TP J506. Set the electronic multimeter to the 1 volt range.

(d) Adjust capacitor C507 and C535 for maximum output indication on the electronic multimeter.

(e) Remove test equipment and reconnect P511 to J511.

(f) Close and lock the converter drawer.

f. HF OSCILLATOR.

(1) TEST SET-UP.—Pull out the converter drawer and tilt it 90 degrees, exposing the bottom section of the lower deck. Insert patch cord W624. This permits access to the slotted shafts of the adjustable capacitors and inductors of the HF oscillator. A hole in the lower deck makes possible the insertion of a lead from the signal generator to test point TP J253 with both decks tight against each other. With this setup it is also possible to insert a lead from the 1 mc and 100 kc jacks of the front panel above TUNING and FREQ. STAND. switches to test point TP J52 (figure 5-12) of the preselector.

(2) CONNECTIONS.

(a) Connect the 1 mc output of the crystal oscillator (TP J702) to the 1st RF amplifier input (TP J52).

(b) Connect signal generator to harmonic mixer grid (TP J253).

(c) Remove P707 from J707 at the crystal oscillator assembly.

(3) PROCEDURES.—Condition the receiver for A1 reception. Set BAND switch to 2-4 position, MEGACYCLE counter to 02.0, and KILOCYCLE

counter to 00.0. Adjust signal generator output to 2900 kc (10,000 uv).

(a) Adjust L301 for minimum indication on the 100 KC TUNING meter.

(b) Set signal generator output to 4900 kc (10,000 uv). Set MEGACYCLE counter to 04.0. Adjust C308 for minimum indication on the 100 KC TUNING meter.

(c) Repeat steps *(a)* and *(b)* for the remaining band positions using table 6-3 for the correct frequencies and control settings.

(d) Remove the signal generator from TP J253 and reconnect P707 with J707. Plug phones in LINE A PHONE jack.

(e) Remove MEGACYCLE counter bezel (4 tapped screws). Set MEGACYCLE counter to 0.205 (the last digit, 5, is a calibration figure used to establish the midposition of the preceding digit). Readjust L301 for a 1 kc tone in the phones while obtaining a minimum indication on the 100 KC TUNING meter.

(f) Set MEGACYCLE counter to 0.405. Readjust C308 for a 1 kc tone in the phone while obtaining a minimum indication on the 100 KC TUNING meter. Readjust variable components at the low and high edge of each band alternately to compensate for interaction between adjustments of the inductor at the low edge and the capacitor at the high edge of the band.

(g) Repeat steps *(e)* and *(f)* for the remaining band positions using table 6-3 for the correct frequencies and control settings. When performing these steps it should be noted that the 5 digit should always appear in addition to the frequency reading. Replace the MEGACYCLE counter bezel and remove connection between TP J702 and TP J52.

CAUTION

When V301 is replaced, capacitor C311 should be adjusted to compensate for changes in oscillator frequency because of tube differences. To make field adjustments without using a signal generator, perform steps (a), (e) and (f) with the MEGACYCLE counter set at 30.005.

g. HARMONIC AMPLIFIER.

(1) TEST SETUP.—Pull out the converter drawer and tilt it 90 degrees, exposing the bottom section of the lower deck. This permits access to the slotted shafts of the adjustable capacitors and inductors of the harmonic amplifier. A hole in the lower deck makes possible the insertion of a lead from the signal generator to test point TP J202 (figure 5-39) with both decks tight against each other.

(2) CONNECTIONS.

(a) Connect signal generator to TP J202 at input to harmonic amplifier stage V201.

(b) Connect the electronic multimeter through diode probe between pin 1 of T501 (figure 5-22), located in the injection IF amplifier section, and ground.

(c) Remove P707 from J707 at the crystal oscillator assembly.

(3) PROCEDURES.

(a) Set MEGACYCLE counter to 02.0 and adjust signal generator output to 2900 kc (5,000 uv).

(b) Adjust L201, L205, and L251 for maximum indication on the electronic multimeter.

(c) Set MEGACYCLE counter to 04.0 and the signal generator output to 4900 mc (5,000 uv). Adjust C211, C226, and C256 for maximum indication on the electronic multimeter.

(d) Repeat steps *(b)* and *(c)* for the remaining band positions using table 6-3 for the correct frequencies and control settings.

(e) Remove test equipment and reconnect P707 to J707.

(f) Place BAND switch to 2-4 position. Set MEGACYCLE counter to 02.0 (100 KC TUNING meter showing minimum indication). Readjust L201, L205, and L251 for minimum indication on the 100 KC TUNING meter.

(g) Set MEGACYCLE counter to 04.0 (100 KC TUNING meter showing minimum indication). Readjust C211, C226, and C256 for minimum indication on the 100 KC TUNING meter. Readjust variable components at the low and high edge of each band alternately to compensate for interaction between adjustments of the inductor at the low edge and the capacitor at the high edge of the band.

(h) Repeat steps *(f)* and *(g)* for the remaining band positions using table 6-3 for the correct frequencies and control settings.

h. PRESELECTOR.

(1) CONTROL SETTINGS.

(a) H.F. ADJ. control set to the center of the control range, with the center position approximated by setting midway between control stops.

(b) KILOCYCLE counter set to 50.0.

(c) ANT. CPLG. control to NOR. position.

(2) TEST SETUP.—Pull out the converter drawer and install patch cable W624 between the converter blister and the converter drawer. Raise upper deck to its 70-degree position. Condition the receiver for A3 reception.

(3) CONNECTIONS.
(See figure 5-12.)

(a) Remove P2802 from J2802 at the antenna coupler and connect signal generator to J2802. The output impedance of the signal generator is to be adjusted to match the 50-ohm impedance of the receiver.

(b) Connect phones to LINE A PHONES jack.

(4) PROCEDURES.

(a) Set MEGACYCLE counter to 02.0 and adjust signal generator output to approximately 2050 kc,

TABLE 6-3. ALIGNMENT CHART, HARMONIC AMPLIFIER AND HF OSCILLATOR

INPUT FREQUENCY	BAND (MC)	MEGACYCLE COUNTER SETTING	HARMONIC AMPLIFIER 1	HARMONIC AMPLIFIER 2	HARMONIC AMPLIFIER 3	HF OSCILLATOR 4
2900 KC	2-4	02.0	L201	L205	L251	L301
4900 KC		04.0	C211	C226	C256	C308
4900 KC	4-8	04.0	L202	L206	L252	L302
8900 KC		08.0	C212	C227	C257	C309
8900 KC	8-16	08.0	L203	L207	L253	L303
16900 KC		16.0	C213	C228	C258	C310
16900 KC	16-32	16.0	L204	L208	L254	L304
32900 KC		32.0	C214	C224	C259	C311

(See figures 5-36 and 5-39.)

modulated 30% at 1000 cps (1,000 uv) to obtain a 1 kc signal in the phones and maximum indication on the LINE A OUTPUT meter. Adjust the signal generator output amplitude to obtain a convenient audio level.

(b) Adjust L51, L58, L101, and L151 for maximum indication on the LINE A OUTPUT meter. As these adjustments are made it may be necessary to readjust the output frequency of the signal generator for maximum reading on the LINE A OUTPUT meter. The signal amplitude of the signal generator's output must be continuously reduced during these adjustments to maintain a convenient reading on the LINE A OUTPUT meter.

(c) Remove the signal generator from J2802. Connect lead from TP J702, 1 mc at crystal oscillator assembly, to TP J52.

(d) Place B.F.O. switch to ON position. Set KILOCYCLE counter to 00.0.

(e) Rotate H.F. ADJ. control clockwise for a maximum indication on LINE A OUTPUT meter. Maximum indication should be obtained before H.F. ADJ. control reaches maximum clockwise position.

Note

> If this result is not obtained see NOTE in step *(f)* below.

(f) Set the MEGACYCLE counter to 01.9 and the KILOCYCLE counter to +00.0. Rotate H.F. ADJ. control counterclockwise for a maximum indication on LINE A OUTPUT meter. Maximum indication should be obtained before H.F. ADJ. control reaches maximum counterclockwise position.

Note

> If the results indicated in steps *(e)* and *(f)* are not obtained the center position selected for the H.F. ADJ. control [see paragraph 6-3*b*(1)(*a*)] was not correct; therefore, a new center position for the control must be selected based on which of the results was not received. Repeat the complete procedure with the new setting of the H.F. ADJ. control.

(g) Remove connection from TP J702 and TP J52. Connect signal generator to J2802. Place B.F.O. switch to OFF position.

(h) Set MEGACYCLE counter to 02.0, KILOCYCLE counter to 50.0, and H.F. ADJ. control to approximately center position. Adjust signal generator output to approximately 2050 kc, modulated 30% at 1000 cps to obtain a 1 kc signal in the phones and a maximum indication on LINE A OUTPUT meter. Adjust signal generator output amplitude to obtain a convenient audio level. Peak H.F. ADJ. control to obtain maximum indication on LINE A OUTPUT meter.

Note

> The positions of the H.F. ADJ. control and the KILOCYCLE counter shall not be changed for the remainder of this procedure.

(i) Set MEGACYCLE counter to 04.0. Adjust signal generator output to approximately 4050 kc, modulated 30% at 1000 cps to obtain a 1 kc signal in the phones and a maximum indication on LINE A OUTPUT meter. Adjust signal generator output amplitude to obtain a convenient audio level. Peak C51 (ANT. COMP.), C54, C101, and C153 for maximum indication on LINE A OUTPUT meter. Readjust variable components at the low and high edge of each band alternately to compensate for interaction between adjustments of the inductor at the low edge and the capacitor at the high edge of the band.

(j) Place BAND switch in 4-8 position and set MEGACYCLE counter to 04.0. Adjust signal generator frequency and output to obtain maximum indication on LINE A OUTPUT meter. Adjust L52, L59, L102, and L152 to obtain maximum indication on the LINE A OUTPUT meter.

(k) Repeat steps *(i)* and *(j)* for the remaining band positions using table 6-4 for correct frequencies and control settings. Remove signal generator and connect P2802 with J2802.

i. TUNABLE IF FILTER.

(1) CONTROL SETTINGS.—SET KILOCYCLE counter to 50.0.

(2) TEST SETUP.—The setup for this operation is similar to that described for the harmonic amplifier

TABLE 6-4. ALIGNMENT CHART, PRESELECTOR

INPUT FREQUENCY	BAND (MC)	MEGACYCLE COUNTER	1	2	3	4
2.05 MC	2-4	02.0	L51	L58	L101	L151
4.05 MC		04.0	C51*	C54	C101	C153
4.05 MC	4-8	04.0	L52	L59	L102	L152
8.05 MC		08.0	C51*	C55	C102	C154
8.05 MC	8-16	08.0	L53	L60	L103	L153
16.05 MC		16.0	C51*	C56	C103	C155
16.05 MC	16-32	16.0	L54	L61	L104	L154
32.05 MC		32.0	C51*	C57	C105	C157

*C51 is the ANT. COMP. (antenna compensator) control on the front panel of the converter drawer.

in paragraph 6-3*f*(1). This arrangement exposes TP J152 (figure 5-12) and TP J502 (figure 5-22) as well as inductors L351, L353, L354, and L356 (figure 5-15).

(3) CONNECTIONS.

(a) Connect signal generator to test point TP J152 (figure 5-12) at grid 1 (pin 1) of preselector mixer V151, located in the lower deck of the converter unit.

(b) Connect diode probe of electronic multimeter to test point TP J503 (figure 5-22) at pin 1 of V502 of the injection mixer, also on the lower deck of the converter unit.

(4) PROCEDURES.

(a) Set the signal generator to 1675 kc and for .1 volt output.

(b) Set the electronic multimeter for the 1 volt range.

(c) Adjust slug-tuned inductors L351, L353, L354, and L356 (figure 5-15) for maximum output indication on the electronic multimeter.

Note

These adjustments at 1675 kc are essentially suitable for the entire 100 kc band coverage of the tunable filter. As a check on the response of the filter when set at the edges of the band, reset the signal generator to 1625 kc first, and tune KILOCYCLE counter to +00.0 and then to 1725 kc tune KILOCYCLE counter to 00.0 using same voltage output from the generator at these frequencies as for 1675 kc. In each case the voltage at each band edge should not drop below 70 per cent of the response at 1675 kc.

6-4. DEMODULATOR.

a. 80 KC IF FILTER.

(1) TEST SETUP.—Extend and lock demodulator drawer. Tilt the upper deck to expose jacks J1301, J1302, and J1303 (figure 5-25) from the top of the lower deck. It is now also possible to remove the bottom cover of the 80 kc filter unit and adjust variable capacitors C1301 and C1303.

(2) CONNECTIONS.—Alignment of this .filte requires a signal generator to provide signals not onl at a center frequency of 80 kc, but also at either edg of a 12 kc bandwidth. To ensure an 80 kc center fre quency output from the signal generator comparabl in accuracy to the precise 80 kc signal obtainable fron the receiver, the signal generator is made to "zero beat with the receiver's 80 kc signal. To do this, make th following connections:

(a) Connect lead from 1 mc crystal oscillato output at TP J702 (figure 5-55) to TP J52 (figure 5-12 at input to 1st RF amplifier stage V51.

(b) Connect signal generator to test point T J1609, (figure 5-33) located on the chassis of the de modulator deck at the input to IF amplifier stag V1601.

(3) PROCEDURES.

(a) PRELIMINARY ADJUSTMENT OF SIGNAL GENERATOR.

1. Set the signal generator to 80 kc (unmodu lated) at 10 millivolts output.

2. Set R.F. SELECTIVITY BW-KCS switch t 12.0.

3. Place BAND switch to 2-4 position. MEGA CYCLE counter to 03.0. KILOCYCLE counter to 00.0 .5 KC/CONT. TUNING switch to .5 KC.

4. Listen to the AM output at LINE PHONES jack, and adjust the signal generator fo "zero beat."

5. Remove connection between TP J702 an TP J52.

(b) ADJUSTMENT OF 80 KC IF FILTER.

1. Remove bottom cover of the 80 kc IF filte unit. (This unit is located in front of the demodulato unit power supply in the lower deck of the demodulato unit.)

2. Connect signal generator (80 kc) to T J505 (injection IF amplifier).

3. Close converter drawer. (Remove patc cable W624, if used.)

Note

> Correction between the signal generator and TP J505 can be made through opening behind filter panel on the converter drawer.

4. Connect diode probe of electronic multimeter to TP J1609 and set it to the 1 volt scale.

5. With the signal generator set to 80 kc (50 millivolts), vary capacitors C1301 and C1303 (figure 5-25) for maximum indication on the electronic multimeter.

6. Remove all test equipment and close and lock demodulator drawer.

b. 80 KC VARIABLE IF.

(1) TEST SETUP.—Extend and lock demodulator drawer; tilt upper deck 85 degrees.

(2) CONNECTIONS.

(a) Connect signal generator to test point TP J1609 (figure 5-33).

(b) Connect dc probe of electronic multimeter to test point TP J1610.

(3) PROCEDURES.

(a) PRELIMINARY ADJUSTMENT OF SIGNAL GENERATOR.

1. Adjust signal generator for precisely 80 kc by "zero beat" method [see 6-4*a*(3)*(a)*].

2. Set electronic multimeter to 1 volt dc range and adjust signal generator output to provide a convenient meter reference. The input level required depends on the filter being used.

(b) ADJUSTMENT OF .350 KC BANDPASS FILTER (FL601).

1. Set R.F. SELECTIVITY BW-KCS control (S1601 and S1602, ganged) to .350.

2. Adjust trimmer capacitors C1662 and C1665 for maximum electronic multimeter output indication.

(c) ADJUSTMENT of 1.0 KC BANDPASS FILTER (FL1602).

1. Set R.F. SELECTIVITY BW-KCS control to 1.0.

2. Adjust trimmer capacitors C1663 and C1666 for maximum electronic multimeter indication.

(d) ADJUSTMENT OF 3.0 KC BANDPASS FILTER (FL1603).

1. Set R.F. SELECTIVITY BW-KCS control to 3.0.

2. Adjust trimmer capacitors C1664 and C1667 for maximum electronic multimeter indication.

Note

> Adjustment of these bandpass filters is carried out only on the center frequency of the respective bandwidths. The procedure is satisfactory in this instance due to the comparatively narrow bandwidth requirements of these bandpass filters, so that, with the single center-frequency adjustment, fairly constant output is attained even at the edges of the band.

3. Remove all test equipment, return R.F. SELECTIVITY BW-KCS control to original setting. Close and lock demodulator drawer.

c. BFO.

(1) CONTROL SETTINGS.

(a) Set R.F. GAIN control as required.

(b) Set A.M. A.F. LEVEL control to maximum clockwise.

(c) Set A.M.-A.G.C. TIME CONST. switch to OFF.

(d) Set R.F. SELECTIVITY BW-KCS switch to 12.0.

(e) Adjust H.F. ADJ. control as required.

(2) TEST SETUP. — Refer to CONNECTIONS below for preliminary setup to insert a precise 1 mc signal in the preselector subassembly prior to actual adjustment procedures for BFO components. On completion of the preliminary installation, pull out and lock demodulator drawer. Capacitors C1636 and C1653 (figure 5-33) are now accessible from the top of the upper deck.

(3) CONNECTIONS.—Preliminary to adjustment of BFO circuit trimmer capacitors, unlock converter drawer, pull out, and lock in place. Release upper deck and tilt it to its 70-degree position. Connect TP J702 (figure 5-55) of the crystal oscillator front panel to J52 of the preselector subassembly (figure 5-12). (The cable is fed from the panel connection to the chassis connector through the air intake space in the upper deck panel.) Return upper deck to horizontal position, taking care not to pinch the cable between decks. Close and lock drawer. Also connect 600-ohm phones to LINE A PHONES jack.

(4) PROCEDURE.

(a) BFO ADJUSTMENT.

1. Set B.F.O. switch to ON and KILOCYCLE counter to 03.0.

2. Set VAR. B.F.O. control clockwise to 10.

3. Adjust capacitor C1653 for zero beat.

4. Set KILOCYCLE counter to −97.0.

5. Rotate VAR. B.F.O. control counterclockwise toward 10 until a zero beat is obtained. If zero beat is not detected by the time the extreme counterclockwise indication (10) is reached, set VAR. B.F.O. (in this same area) at a point where the tone pitch is lowest. Readjust capacitor C1653 for zero beat at this setting of the VAR. B.F.O. control.

6. Set KILOCYCLE counter back to 03.0.

7. Rotate VAR. B.F.O. control clockwise toward 10 and check that zero beat occurs in the clockwise position close to 10. The VAR. B.F.O. circuit adjustment is complete when zero beat is obtained in the vicinity of 10 in either direction from zero, as outlined in steps 2 to 7 above.

8. Return all controls to original preliminary settings, and remove coax cable from TP J702 and J52.

d. GAIN BAL (GAIN BALANCE) ADJUSTMENTS.

Note

Gain balance adjustments in the respective detector-amplifiers are based on a common reference output signal level established in one of them; hence an interdependence exists among the three detector-amplifiers, making desirable a common approach to all three.

(1) TEST EQUIPMENT.—SIGNAL GENERATOR AN/URM-25D is used in addition to the receiver's output meters (LINE A OUTPUT and LINE B OUTPUT) to ensure proper adjustments for desired outputs.

(2) CONTROL SETTINGS.

(a) Set RECEPTION A.M./S.S.B. switch to S.S.B.

(b) Set A.F. LEVEL LINE A control maximum clockwise. Do likewise for A.F. LEVEL LINE B control.

(3) CONNECTIONS. — Remove P1001 of coax cable W653 from J1001 of the USB detector-amplifier (figures 5-49 and 6-8), and connect in its place Signal Generator AN/URM-25D.

(4) PROCEDURES.

(a) Extend demodulator drawer outward and tilt the upper deck to make accessible the top of the lower deck. (See figure 6-8.)

(b) Set the signal generator output for 1000 uv at 78 kc.

Note

The 78 kc signal from the signal generator and the 80 kc signal from carrier amplifier V1104 (figure 6-19) combine at the input of ring demodulator Z1101 to provide the 1 kc audio output signal which actuates the LINE A OUTPUT meter.

(c) Adjust GAIN BAL. control R1025 (figure 5-49 and figure 6-19, cathode circuit of IF amplifier V1004) to cause LINE A OUTPUT meter to indicate +8 db.

(d) Retune signal generator to 82 kc at the same output of 1000 uv noted in step 2.

(e) Adjust GAIN BAL. control R1128 (figure 5-72 and figure 6-19, cathode circuit of IF amplifier V1105) to +8 db on LINE B OUTPUT meter.

(f) Remove signal generator from J1001 and reconnect P1001 to J1001.

(g) Note noise level at LINE A OUTPUT meter.

(h) Reset RECEPTION A.M./S.S.B. switch to AM., R.F. SELECTIVITY BW-KCS switch to 3.0, and A.M. A.F. LEVEL control to maximum clockwise.

(i) Adjust GAIN BAL. control R1602 (figure 5-33 and figure 6-18, cathode circuit of IF amplifier V1601) to indicate +8 db on LINE A OUTPUT meter.

e. USB GAIN BAL ADJUSTMENT. — See paragraph 6-4*d* above.

f. LSB GAIN BAL ADJUSTMENT. — See paragraph 6-4*d* above.

g. AM GAIN BAL ADJUSTMENT. — See paragraph 6-4*d* above.

6-5. REMOVAL, ADJUSTMENT, REPAIR AND REASSEMBLY OF PARTS AND SUBASSEMBLIES.

a. GENERAL. — This section deals with removal of subassemblies from the receiver, removal of individual components from the subassemblies, repair of components as required and where applicable, reassembly of components in the subassembly, and reinstallation of the subassemblies. It also includes lubrication information, such as the specific lubricant to be used and the frequency of application. Reference figures are also indicated where pertinent to show relative positions of the functional sections in the drawers and to facilitate removals and reinstallations.

b. CONVERTER MAINTENANCE.

(1) ANTENNA COUPLING.

(a) REMOVAL. — The antenna coupling subassembly secures to the front panel of the converter (figure 6-2). Since coax cable connectors must also be removed from the subassembly from the bottom section of the lower deck, tilt the converter unit 45 degrees to expose bottom area.

1. Extend converter drawer and tilt it 90 degrees.

2. Remove P2801 of interconnecting coax cable W606 from J2801 (figure 5-9).

3. Remove P2802 of interconnecting coax cable W605 from J2802.

4. Return drawer to the horizontal position.

5. Remove the four mounting screws which secure the subassembly to the front panel.

6. Remove the complete unit from the front panel.

(b) ADJUSTMENT AND REPAIRS.—Due to the relative simplicity of the antenna coupling subassembly, little repair work need be anticipated. The two components most likely to require attention are (1) fuse F2801 and (2) switch S2801.

1. To reach the fuse for removal, gently pry open the hole plug located below the switch knob. The hole plug is on the front panel, making removal of the antenna coupling unnecessary.

2. Replace the defective fuse and reinsert the hole plug by pressing around the edges of the hole for a snap fit.

Note

It is recommended that no attempt be made to repair switch S2801. It is too complex and precise. If a switch becomes defective, remove it and replace with a new switch.

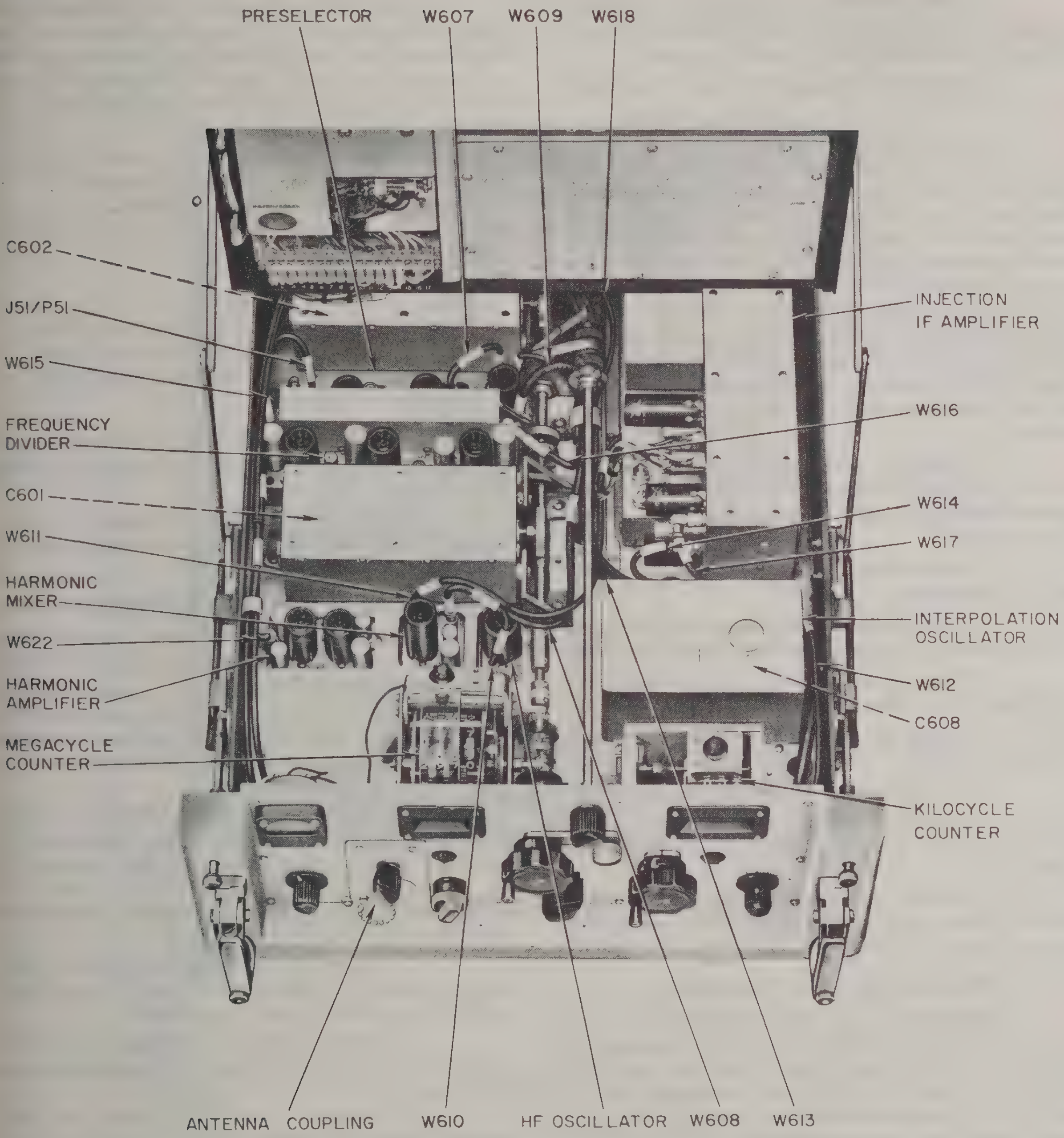

PRESELECTOR
W607
W609
W618
C602
J51/P51
W615
FREQUENCY DIVIDER
C601
W611
HARMONIC MIXER
W622
HARMONIC AMPLIFIER
MEGACYCLE COUNTER
INJECTION IF AMPLIFIER
W616
W614
W617
INTERPOLATION OSCILLATOR
W612
C608
KILOCYCLE COUNTER
ANTENNA COUPLING
W610
HF OSCILLATOR
W608
W613

Figure 6-2. Converter Drawer, Lower Deck, Top View

3. Remove the subassembly from the converter panel as directed in paragraph 6-5*b*(1)(*a*).

4. Remove the subassembly panel knob from the switch shaft by loosening two set screws.

5. Remove the back cover of the subassembly and unsolder all leads and resistor pigtails from the switch's electrical contacts.

Note

Code all leads to be resoldered to the contacts of the new switch for correct and rapid reinstallation.

6. When all leads are unsoldered and the panel knob removed, loosen the nut securing the shaft to the panel. Remove the nut and washer.

(c) REPLACEMENT. — This section covers replacement of defective components and reinstalling of the entire subassembly in the converter unit.

1. Insert the switch shaft in the hole provided for it.

2. Apply washer and nut to the shaft at the front panel of the subassembly and secure the switch. The body of the washer is modified by extensions beyond both outer and inner circles of the washer. The outer extension is bent 90 degrees and fits into a small hole in the front panel adjacent to the shaft hole, thus fixing the position of the washer. The inner extension of the washer fits into a groove in the threaded portion of the switch shaft. In this way, the original switch (or its replacement) can always be reinstalled according to a predetermined position, with the connecting leads also properly positioned and of suitable length for reconnecting.

3. Place the knob on the switch shaft and secure it with the two set screws, making sure that the pointer setting conforms with the corresponding setting of the switch.

4. Solder coded leads to the appropriate contacts on the switch.

5. Secure back cover to subassembly with three screws fitting into tapped holes on lips of the panel.

6. Place the subassembly into the opening at the bottom left of the converter front panel.

7. Secure the subassembly to the front panel with four screws.

8. Tilt the converter unit 90 degrees.

9. Connect P2801 of coax cable W606 to jack J2801 and P2802 of coax cable W605 to jack J2802 (figure 6-3).

10. Return converter unit to its horizontal position. Push the unit into its cabinet housing and lock in place.

(2) PRESELECTOR MAINTENANCE.

(a) REMOVAL OF PRESELECTOR 1st RF AMPLIFIER SUBASSEMBLY.—With the exception of removal of P51 of coax cable W606 from jack J51 (figures 5-12 and 6-2), all work pertaining to removal of the preselector 1st RF amplifier from the converter can be done with the bottom section of the lower converter deck exposed.

1. Pull out the converter drawer and lock it. Tilt the upper deck to the 70-degree slot to make the top of the lower deck accessible.

2. Remove P51 of coax cable W606 from jack J51.

3. Return the upper deck to its horizontal position, and tilt both decks of the converter 90 degrees to expose the bottom of the lower deck.

4. Unsolder leads from feed-through capacitors C60, C62, C65, C69, and C71 (figure 5-12).

5. Remove rod used to vary antenna compensator capacitor C51. To do this, remove two flathead screws from each of three straps securing the rod to the right side of the converter (looking at bottom from the panel edge). The rod removes immediately on removal of the screws.

6. Remove the two bracket guides and switch slide located back of the preselector subassemblies. The guides keep in place the switch slide used to actuate band-changing switches S51 and S52 of the 1st RF amplifier stage.

Note

Set panel BAND switch knob to 16-32. This setting makes it possible to reach the screws of the bracket guide to the rear of the 1st RF amplifier subassembly.

7. Unsolder resistor R56 from feed-through terminals E55, also leads from feed-through terminals E51, E52, E53, and E54.

8. Loosen three captive mounting screws securing the subassembly to the chassis, and remove it from the converter.

(b) ADJUSTMENT AND REPAIR.

1. ACCESS TO V51 SOCKET.—Provision has been made for gaining access to the socket of V51 for voltage measurements by including a separate cover plate between adjustment screws for slug-tuned inductors L60 and L61. By removal of three mounting screws from this plate, access to the tube socket is obtained.

2. REMOVAL OF SWITCHES S51 AND S52.—The preselector 1st RF amplifier subassembly is assumed to have been removed from the converter by the procedures of paragraph 6-5*b*(2)*(a)*. Since the steps below are typical for both switches, discussion is limited to the removal of one.

(1) Unsolder all leads connecting to contacts of switch S51 (figure 5-12). Code all unsoldered leads for correct and rapid reinstallation.

(2) Remove the arm connected to the switch casting at the rear of the subassembly by removing two mounting screws.

(3) Remove the switch from the subassembly by removing two screws from the protruding plate on the side lip of the subassembly.

(c) REPLACEMENT OF 1st RF AMPLIFIER.

1. REPLACEMENT OF COVER PLATE. — The plate cover for access to the socket of V51 is replaceable. Fit the plate above the mounting holes on the bottom of the subassembly and insert three mounting screws.

2. REPLACEMENT OF SWITCHES S51 AND S52.—In conformance with the introduction note of paragraph 6-5*b* (2)*(b)2*, discussion on installation of a replacement switch is confined to one switch.

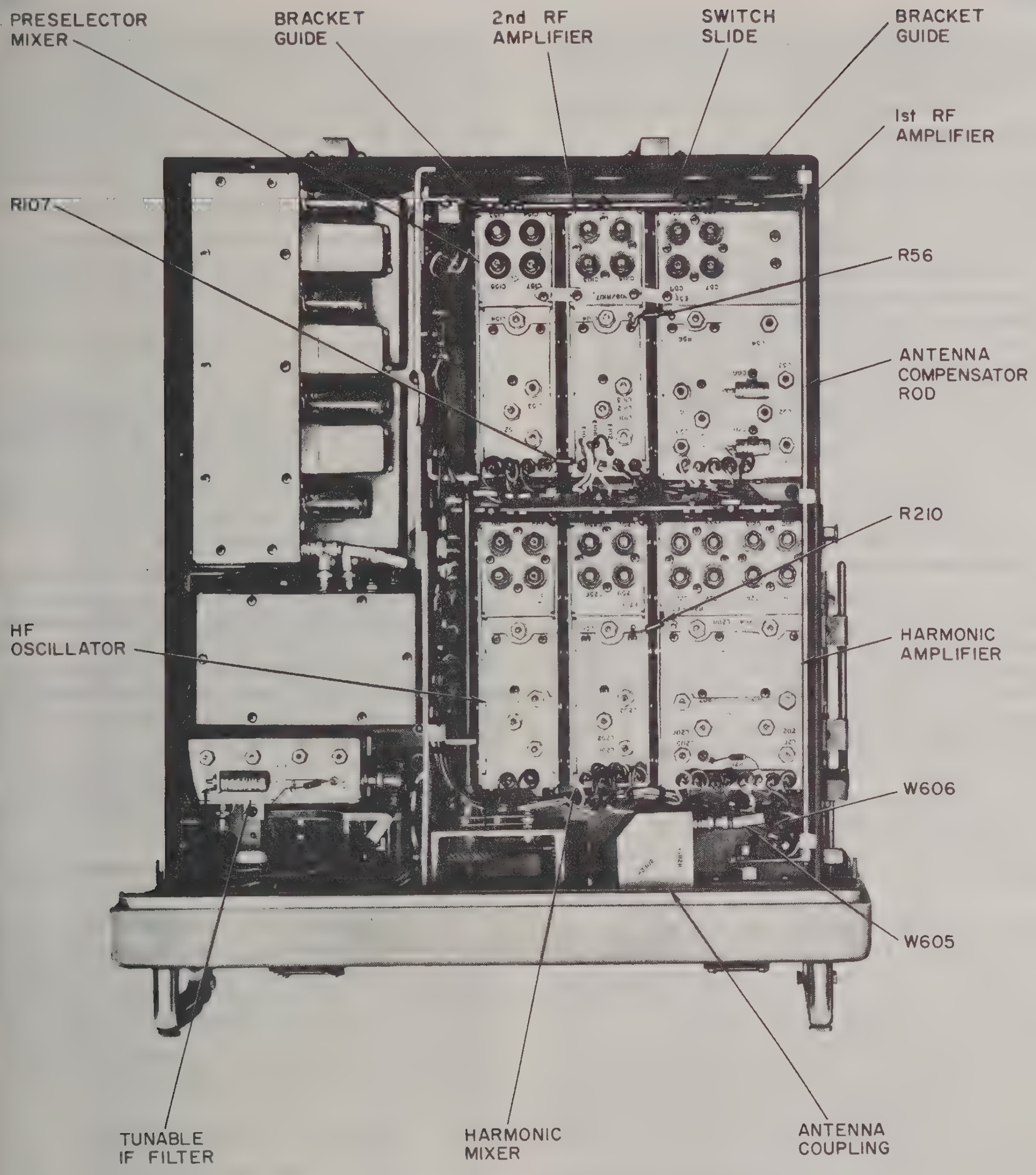

PRESELECTOR MIXER
BRACKET GUIDE
2nd RF AMPLIFIER
SWITCH SLIDE
BRACKET GUIDE
1st RF AMPLIFIER
R107
R56
ANTENNA COMPENSATOR ROD
R210
HF OSCILLATOR
HARMONIC AMPLIFIER
W606
W605
TUNABLE IF FILTER
HARMONIC MIXER
ANTENNA COUPLING

Figure 6-3. Converter Drawer, Lower Deck, Bottom View

(1) Insert switch S51 in position so that the holes at its side correspond with the clearance holes on the mounting plate of the side lip of the subassembly and the rear casting of the switch fits the hole provided for it at the rear of the subassembly.

(2) Connect the arm (for band changing) to the casting of the switch with two mounting screws. Install with the projecting pin of the arm positioned opposite to the position of the mounting screws of the subassembly.

(3) Solder leads to electrical connections of the switch as indicated by previous coding of the leads.

3. REPLACEMENT OF PRESELECTOR 1st RF AMPLIFIER SUBASSEMBLY.

(1) Place the subassembly in position from the bottom of the lower converter deck so that the captive mounting screws in the subassembly correspond in position with the mounting holes and secure it to the lower deck.

(2) Solder resistor R56 to feed-through terminal E55 and solder (previously coded) leads to terminals E51, E52, E53, and E54.

(3) Insert switch slide into the bracket guide that is free of the switch slide.

(4) Insert the switch slide to fit the projecting pins of the switch-connected arms.

Note

> This step refers, in this instance, only to the preselector 1st RF amplifier. Actually, the switch slide must be similarly connected to the pins of two other arms which are operated, during band changing, simultaneously with those of the preselector 1st RF amplifier stage. These other arms are located at the rear of the preselector 2nd RF amplifier and preselector mixer subassemblies.

(5) Install the two bracket guides and the switch slide, with the bracket-guide mounting holes over corresponding holes on the chassis.

(6) Secure bracket guides to chassis.

(7) Install rod used to vary antenna compensator capacitor C51 by fitting the holes of each of three straps holding the rod to corresponding mounting holes in the right side of the converter (looking at the bottom from the panel edge) and connect (loosely) the straps to the side wall with two mounting screws for each strap. Also adjust the positions of the geared quadrants connecting the panel ANT. COMP. knob to the spur gear on the shaft of C51 as follows:

(8) Turn ANT. COMP. knob to 10 in clockwise direction.

(9) Set spur gear on shaft of ANT. COMP. control (C51) so that mark on gear and mark on box containing C51 coincide. These marks are established during production of the receiver, and serve to indicate maximum capacity (when the marks coincide) for C51. C51 is ordinarily confined within its box covering and is not available for viewing; hence the need for a means of identifying the relative positions of the capacitor plates.

(10) Engage one of the two quadrants of the antenna compensator rod with the gear on the front panel control, and the other quadrant with the gear on C51, so that turning the ANT. COMP. knob will turn C51 approximately 180 degrees.

(11) Solder coded leads to feed-through capacitors C60, C62, C65, C69, and C71.

(12) Lower the converter until both sections (upper and lower deck) are horizontal. Now tilt the upper deck of the converter to the 70-degree slot, exposing the top of the preselector 1st RF amplifier.

(13) Reconnect P51 of coax cable W606 to jack J51.

(14) Lower the upper deck until both decks are horizontal. Return the converter into the cabinet and lock it in place.

(d) REMOVAL OF PRESELECTOR 2nd RF AMPLIFIER SUBASSEMBLY.—Removal of this subassembly from the converter requires procedures similar to those for removal of the 1st RF amplifier subassembly. With the exception of J102, from which P102 of coax cable W607 is to be disconnected, all other points involved in the removal of the subassembly are reached from the bottom section of the lower converter deck.

1. Pull out the converter drawer and lock it. Tilt the upper deck to the 70-degree slot, exposing the top of the lower deck and the top of the 2nd RF amplifier subassembly.

2. Remove P102 of coax cable W607 from jack J102.

3. Return the upper deck to its horizontal position and tilt both decks of the converter 90 degrees to expose the bottom of the lower deck.

4. Remove two bracket guides and switch slide located back of the preselector subassemblies. Perform this step with BAND switch set to 16-32.

5. Unsolder leads from capacitors C109, C111, and C115 (figure 5-12), located at the forward end of the subassembly. Also unsolder leads from feed-through terminals E101, E102, E103, E104, and E106, resistor R56 from feed-through terminal E105, and resistor R107 from C116. Code all leads removed to facilitate lead identification and future resoldering to the associated terminals.

6. Loosen three captive mounting screws securing the subassembly to the lower deck, and remove the subassembly from the converter.

(e) ADJUSTMENT AND REPAIR OF 2nd RF AMPLIFIER.

1. ACCESS TO V101 SOCKET.—A plate cover secured to the bottom plate of the 2nd RF amplifier subassembly between the adjustment screws of variable inductors L103 and L104 furnishes access to the pins of socket XV101 for voltage and resistance measurements. Access is obtained on removal of three mounting screws holding the plate cover secure against the subassembly bottom plate.

2. REMOVAL OF SWITCH S101.

(1) With the 2nd RF amplifier subassembly removed from the converter, remove the side plate of the subassembly nearest to the top-mounted tube socket XV101.

(2) Unsolder all leads connecting to contacts of switch S101. Code all unsoldered leads for correct and rapid reinstallation.

(3) Remove arm connected to the switch casting at the rear of the subassembly by removing two mounting screws securing arm to switch.

(4) Remove the switch from the subassembly by removing two screws securing the switch to the side plate opposite from the one previously removed.

(*f*) REPLACEMENT OF 2nd RF AMPLIFIER.

1. REPLACEMENT OF COVER PLATE.—Replace the plate cover for access to socket XV101 by fitting the plate holes above the corresponding mounting holes on the bottom of the subassembly and inserting three mounting screws.

2. REPLACEMENT OF SWITCH S101.

(1) Insert switch S101, with the mounting holes at the side of its casting corresponding to the holes at the side plate of the subassembly and with the casting of the switch fitting the hole provided for it at the rear of the subassembly.

(2) Connect the arm (used for band changing) to the casting of the switch with two mounting screws. Install with the projecting pin of the arm positioned so that the band coverage of the coils connected electrically into the amplifier stage by the BAND switch control knob on the front panel conforms with the band range indicated by the BAND knob.

(3) Solder leads to electrical connections of the switch as indicated by previous coding of the leads.

3. REPLACEMENT OF PRESELECTOR 2nd RF AMPLIFIER SUBASSEMBLY.

(1) Place the subassembly in position from the bottom of the lower converter deck so that the captive mounting screws in the subassembly correspond in position with the mounting holes of the lower deck and secure the subassembly to the lower deck.

(2) Solder resistor R56 to feed-through terminal E105, resistor R107 to feed-through capacitor C116, and previously coded leads to feed-through terminals E101, E102, E103, E104, and E106, and to feed-through capacitors C109, C111, and C115.

(3) Insert the switch slide to fit the projecting pin of the switch-connected arm. (This operation is directly related to the NOTE of paragraph 6-5*b*(2)(*c*)*3*, and the subassembly is one of the two referred to in that NOTE.) Install the two bracket guides and the switch slide.

(4) Lower the converter until both sections (upper and lower deck) are horizontal, and lock in place. Tilt the upper deck 70 degrees to expose the top of the lower deck and the top portion of the 2nd RF amplifier subassembly.

(5) Reconnect P102 of coax cable W607 to jack J102.

(6) Lower the upper deck until both decks are horizontal. Return the converter into the cabinet and lock it in place.

(*g*) REMOVAL OF PRESELECTOR MIXER SUBASSEMBLY.—Removal of the preselector mixer subassembly is similar to removal of the other two subassemblies of the preselector section with the following exception. In the case of the other two units, the captive screws securing the units to the lower deck are all visible and accessible, without any need for preliminary auxiliary removals. In the case of the mixer subassembly, a third, invisible captive screw, securing the mixer section to the lower deck, can be reached only by removing a plate cover from the bottom section of the mixer subassembly.

1. Pull out the converter and lock it. Tilt the upper deck 70 degrees, exposing the top of the lower deck and the top of the preselector mixer subassembly.

2. Remove P151 of coax cable W607 from jack J151, P153 of coax cable W608 from jack J153, and P154 of coax cable W609 from jack J154.

3. Return the upper deck to its horizontal position, and tilt both decks 90 degrees to expose the bottom of the lower deck.

4. Remove two bracket guides and the switch slide located back of the preselector subassemblies.

Note

> Set panel BAND switch knob to 16-32. This setting makes it possible to reach the screws of the bracket guide to the rear of the mixer subassembly.

5. Unsolder leads from capacitors C160, C164, and C165, located at the forward end of the subassembly. Also unsolder R107 from C151, located adjacent to C165, and leads from feed-through terminals E151 and E152, located at the rear of the mixer subassembly just above the casting of switch S151. Code all leads removed to facilitate lead identification and future reassembly.

6. Remove cover plate from bottom plate of the mixer between adjusting screws of variable inductors L153 and L154. Loosen captive screw on the inside plate of the mixer subassembly made accessible by removal of the cover plate.

7. Loosen the other two captive screws securing the subassembly to the lower deck and remove the subassembly from the converter.

(*h*) ADJUSTMENT AND REPAIR OF MIXER.

1. REMOVAL OF SWITCH S151.—S151 is a ganged switch consisting of two wafers, S151-1 and S151-2. Removal of the switch, except for the added connections involved in the double wafer arrangement, follows the pattern described in previous sections.

(1) With the mixer subassembly removed from the converter and all sides of the subassembly accessible, remove the right side plate (looking at the subassembly from the switch end, and with mounting screws for S151 at the left) to make the wafers of S151 accessible.

(2) Unsolder all leads connecting to contacts of the ganged switch wafers. Code unsoldered leads for future reassembly.

(3) Remove arm connected to the switch casting at the rear of the subassembly by removing two mounting screws securing the arm to the switch.

(4) Remove the switch from the body of the mixer subassembly by removing two bolts securing

the switch to the left side plate, looking at the subassembly as noted in *(1)*.

(i) REPLACEMENT OF PRESELECTOR MIXER.

1. REPLACEMENT OF SWITCH S151.—The procedures involving installation of a replacement switch for S151 are essentially the same as enumerated in section 6-5*b*(2)*(f)2*, with regard for the physical location of dual-wafer switch S151 in the preselector mixer subassembly.

2. REPLACEMENT OF PRESELECTOR MIXER SUBASSEMBLY.

(1) Place the subassembly in position from the bottom of the lower converter deck so that the captive mounting screws, including the one on the inner plate of the subassembly correspond in position with the mounting holes of the lower deck. Secure the subassembly to the lower deck.

(2) Solder R107 to capacitor C151, and previously coded leads to capacitors C160, C164, and C165, and also to feed-through terminals E151 and E152.

(3) Replace the cover plate on the bottom plate of the subassembly between adjusting screws of inductors L153 and L154, and secure to the bottom plate of the mixer subassembly with three mounting screws.

(4) Insert switch slide into bracket guide.

(5) Install the two bracket guides and the switch slide to fit the projecting pin of the switch-connected arm [see NOTE of paragraph 6-5*b*(2)*(c)* *3*]. Perform *(5)* with BAND switch at 16-32.

(6) Lower the converter drawer until both decks are horizontal, and lock the unit in place. Tilt the upper deck 70 degrees to expose the top of the lower deck and the top portion of the mixer subassembly.

(7) Reconnect P151 of coax cable W607 to jack J151, P153 of coax cable W608 to jack J153, and P154 of coax cable W609 to jack J154.

(8) Lower the upper deck until both upper and lower decks are horizontal. Return the drawer into the cabinet and lock it in place.

(3) TUNABLE IF FILTER MAINTENANCE.

(a) REMOVAL.

1. Pull out the converter drawer and tilt the entire unit 90 degrees, exposing the bottom of the lower deck. The tunable IF filter located at the left corner of the lower deck (bottom section), just back of the front panel, is now available for removal (see figure 6-3).

2. Remove P351 of coax cable W609 from jack J351, and P352 of coax cable W614 from jack J352 (figures 5-15 and 6-3).

3. Unsolder the +160 volt lead from feed-through terminal opposite E351 and connecting to resistor R351. Also remove ground lead from capacitor C352.

4. Remove two mounting screws from the filter unit, and remove the filter from the lower deck.

(b) ADJUSTMENT AND REPAIR OF TUNABLE IF FILTER.—Removal of filter components for repair or replacement is conventional in every case except in the removal of four-section tuning capacitor C351. Removing this capacitor involves unsoldering and removal of nearly every component inside the filter casing, in addition to the necessary removal of three inner partitions. Since the capacitor in question is sturdily built and its plates wide-spaced, with small chance of its becoming defective, it is recommended that no effort be made to remove this capacitor except during a general overhaul of the entire receiver at an overhaul depot.

(c) REPLACEMENT OF TUNABLE IF FILTER.

1. Set dot on gear of tunable IF filter capacitor C351 beside dot on tunable IF filter chassis.

2. Set KILOCYCLE counter to +08.0.

3. Place the filter unit in position at the bottom left of the lower deck bottom (figure 6-3), with its mounting holes corresponding with those in the lower deck, and secure the filter to the deck. Make sure, in installing the tunable IF filter, not to disturb the dot alignment of step *1*.

4. Solder the +160 volt lead to feed-through terminal opposite E351. Solder ground lead to capacitor C352 at lug end.

5. Reconnect P351 of coax cable W609 to jack J351 and P352 of coax cable W614 to jack J352.

6. Return the drawer to its horizontal position, push it into the cabinet, and lock it in place.

(4) INJECTION IF AMPLIFIER MAINTENANCE.

(a) REMOVAL.—The injection IF amplifier subassembly is mounted in the lower converter deck with half of the subassembly below the level of the lower deck and the other half above it (figures 6-2 and 6-3). The subassembly is removed from the lower deck by procedures similar to those discussed for removal of other units, but in this case one coax cable, W611, remains permanently connected in the injection IF amplifier subassembly and is therefore removed as part of the IF unit by removing its other connecting end from the harmonic mixer subassembly to which it connects.

1. Pull out the converter drawer and lock it. Tilt the upper deck 70 degrees. With the top of the lower deck exposed, there is access to the upper portion of the injection IF amplifier, located at the right rear of the lower deck, and to the top of the harmonic mixer, located at the left of the lower deck, halfway back from the front panel, back of the MEGACYCLE counter assembly.

2. Unsolder leads from feed-through capacitors C517, C532, C533, C538, and C539 (figures 5-22 and 6-2). Code leads for future reinstallation.

3. Remove P501 of coax cable W614 from J501, P507 of coax cable W618 from J507, and P511 of coax cable W617 from J511.

4. Disconnect coax cable W611 from the harmonic mixer subassembly by removing P252 of the cable from J252 of the harmonic mixer (figures 5-39 and 6-2).

5. Lower the upper deck until it is horizontal, and tilt the entire drawer 90 degrees to make accessible the bottom section of the lower deck.

6. Remove P509 of coax cable W612 from J509.

7. Loosen the six captive screws of the chassis mounting plate, and remove the injection IF amplifier subassembly from the bottom of the lower deck.

(b) ADJUSTMENT AND REPAIR OF INJECTION IF AMPLIFIER.—The injection IF amplifier subassembly is put together in such a way that a minimum of effort is involved in the removal of components for repairs or replacement. No mechanical adjustments of components are necessary beyond the settings involved in the electrical alignment of the amplifier. Removal of components for replacement requires only routine procedures involving unsoldering of interfering leads and removing mounting screws. If terminal boards are to be loosened temporarily for easier access to components, the only requirement is to remove screws from three captive nuts in TB501, two screws from captive nuts in TB502, and two screws and nuts from TB503 and TB504.

1. ACCESS TO T501.—Transformer T501 can be disassembled either for testing components within the shield can, or for removal and replacement of component parts. Since the makeup of T501 is typical also of T502 and T503, the following information applies to all three transformers. The shield can is held in place by two screws applied through the top and into threaded brass posts within the can. These posts, also threaded at the bottom, extend through the ceramic base of T501, through a rectangular fitting for the shield can, and through the chassis, and are secured to the chassis with nuts and washers. The shield can, when properly installed, rests between the rectangular base fitting and the ceramic base of the transformer. To gain access to the inside of the transformer, remove the shield can by loosening the two top screws from the threaded holes of the brass mounting posts within the can. The entire transformer is removed by unsoldering leads from it and removing the nuts and washers from the mounting posts under the chassis.

(c) REPLACEMENT OF INJECTION IF AMPLIFIER.

1. REASSEMBLY OF T501.

(1) Place rectangular base fitting with its clearance holes over corresponding mounting holes in the chassis.

(2) Insert the brass posts of the replacement through the holes referred to in step *(1)*.

(3) Secure the posts to the chassis with nuts and washers.

(4) Place the transformer shield can over the brass mounting posts so that holes at top of the can fit over corresponding threaded holes of the mounting posts, and the can itself fits into the groove between the bottom rectangular fitting and the ceramic base of T501.

(5) Secure can to the mounting posts.

Note

If T501 is to be replaced as a complete unit, remove T501 from its mounting on chassis, unsolder leads and replace with new one in same position on chassis as original transformer being replaced. Such a replacement will involve alignment of the new transformer. Refer to paragraph *6-3e*.

2. REPLACEMENT OF INJECTION IF AMPLIFIER SUBASSEMBLY.

(1) Install injection IF amplifier in place from the bottom of the lower converter deck so that the six captive screws of its chassis mounting plate set over the corresponding mounting holes of the rails in the lower deck. Secure the amplifier to the lower deck.

(2) Reconnect P509 of coax cable W612 to jack J509.

(3) Return the converter drawer to a horizontal position and lock it in place. Tilt the upper deck of the converter unit 70 degrees to expose the top portion of the lower deck.

(4) Connect coax cable W611 to the harmonic mixer subassembly by connecting P252 of the cable to jack J252 of the harmonic mixer.

(5) Connect P501 of coax cable W614 to jack J501, P507 of coax cable W618 to jack J507, and P511 of coax cable W617 to jack J511.

(6) Solder coded leads to associated feedthrough capacitors C517, C532, C533, C538, and C539.

(7) Lower the upper deck of the converter drawer until the upper and lower deck are both horizontal. Push the converter unit into its housing and lock it in place.

(5) HIGH FREQUENCY OSCILLATOR MAINTENANCE.

(a) REMOVAL. (See figures 6-2 and 6-3.)

1. Pull out converter drawer and lock it in place.

2. Tilt the upper deck of the converter drawer 70 degrees, exposing the top of the lower deck of the converter drawer.

3. Remove P301 of coax cable W610 from jack J301 (figure 5-36).

4. Remove P302 of coax cable W608 from jack J302.

5. Lower upper deck until it is horizontal, and tilt entire converter drawer 90 degrees, exposing the bottom section of the converter drawer lower deck.

6. Remove two bracket guides and switch slide located at the switch end of the subassembly. Set the front panel BAND switch knob to 16-32 to facilitate access to bracket guide screws for removal. (Note dot on the HF oscillator box which identifies this band.)

7. Unsolder leads connecting to capacitors C315 and C317 (figure 5-36), and to feed-through terminals E301 and E302. Code the unsoldered leads for future installation.

8. Remove cover plate from between the adjustment screws of variable inductors L303 and L304, and loosen the captive mounting screw connecting the inner plate of the subassembly to the lower deck.

9. Loosen the other two captive mounting screws at each end of the subassembly and remove the HF oscillator from the lower deck.

(*b*) ADJUSTMENT AND REPAIR OF HIGH FREQUENCY OSCILLATOR.

1. REMOVAL OF SWITCH S301.

(1) Remove the right-side cover plate (looking at the subassembly from the switch end, figure 5-36).

(2) Disconnect the arm by removing the two screws securing the arm to the switch casting.

(3) Unsolder all leads connecting to each wafer (S301-1 and S301-2) of the switch, and code the unsoldered leads for future reinstallation.

(4) Remove two mounting screws securing the switch casting to the left side of the subassembly (looking in same direction as in *(1)* above).

(5) Move switch gently back from the subassembly apron, clear it of adjacent components, and remove from the subassembly.

(*c*) REPLACEMENT.

1. REPLACEMENT OF SWITCH S301.

(1) Insert switch S301 so that it fits the hole provided for it at the rear end of the subassembly, and so that the mounting holes of the switch casting correspond with those on the left side of the subassembly (looking in from the switch end of the subassembly, figure 5-36). Secure the switch to the subassembly.

(2) Solder all coded leads to the associated terminals of wafers S301-1 and S301-2 of switch S301.

(3) Connect the arm to the switch casting by tightening two screws (through the arm) to the casting.

(4) Reconnect cover plate to the right side of the subassembly.

2. REPLACEMENT OF HIGH FREQUENCY OSCILLATOR SUBASSEMBLY.

(1) Place the subassembly against the bottom of the lower deck in the position designated for the HF oscillator (figure 6-3) and match the mounting fasteners with the mounting fittings in the lower deck. Secure the oscillator to the lower deck.

(2) Replace cover plate on the bottom plate of the subassembly between the adjustment screws of variable inductors L303 and L304.

(3) Solder coded leads to the associated capacitors C315 and C317, and also to feed-through terminals E301 and E302.

(4) Install the switch slide and bracket guides. The slide is also associated with similar bandswitch arms of the harmonic amplifier and harmonic mixer subassemblies (figure 6-3). Therefore, in setting the switch slide to contain the projecting pins of the four arms involved, make sure that all switches related to this slide are set to the same band range. This will ensure consistent adjustment of the respective bandchanging switches.

(5) Secure two bracket guides and switch slide. Set the arms of the switching arrangement to correspond with the 16-32 setting of the front-panel BAND switch. This will provide access to the screws for securing the guides to the lower deck.

(6) Lower the entire converter drawer to a horizontal position and tilt the upper deck 70 degrees to expose the top of the lower deck and also the HF oscillator subassembly.

(7) Reconnect P301 of coax cable W610 to jack J301.

(8) Reconnect P302 of coax cable W608 to jack J302.

(9) Lower the upper deck so that both upper and lower deck are horizontal.

(10) Push the converter drawer into its housing and lock in place.

(6) HARMONIC AMPLIFIER MAINTENANCE. (See figures 6-2 and 6-3.)

(*a*) REMOVAL OF HARMONIC AMPLIFIER SUBASSEMBLY.

1. Pull out the converter drawer and lock it in place. Tilt the upper deck 70 degrees. The top of the lower deck, including the harmonic amplifier, is now accessible.

2. Remove P201 of coax cable W622 from J201 (figure 5-39).

3. Lower the upper deck until both decks are horizontal, and tilt the entire converter drawer 90 degrees to provide access to the bottom of the lower deck.

4. Remove rod of antenna compensator capacitor C51 [refer to paragraph 6-5*b*(2)(*a*)*5*].

5. Remove two bracket guides and switch slide located at the rear of the harmonic amplifier subassembly. Set the front-panel BAND switch to 16-32 to ensure easier access to the guide mounting screws.

6. Unsolder leads from feed-through capacitors C204, C231, C232, C235, C236, C237, C238, and C239. Also remove leads from feed-through terminals E201, E202, E203, and E204, and R210 from feed-through terminal E205. Note coding of the unsoldered leads for future reinstallation.

7. Loosen the three captive mounting screws of the harmonic amplifier subassembly and remove from the lower deck.

(b) ADJUSTMENT AND REPAIR OF HARMONIC AMPLIFIER.

1. ACCESS TO V201 AND V202.—By removing five screws from the cover plate (at the bottom of the harmonic amplifier subassembly) between adjustments screws of variable inductors L203, L204, L207, and L208, the operator gains access to the pin connections of V201 and V202 for voltage and resistance measurements.

2. REMOVAL OF SWITCHES S201 AND S202.—Both switches are similarly installed. Therefore, the following steps, while referring to one switch, apply to removal of either one. Top and side plates are assumed to have been removed.

(1) Disconnect the arm by removing the two screws securing the arm to the switch casting (figure 5-39).

(2) Unsolder all leads connecting to the switch, and code the unsoldered leads for future reinstallation.

(3) Remove two mounting screws securing the switch casting to the projecting lip on the side of the subassembly.

(4) Move the switch back from the subassembly rear, clear it of adjacent components and remove switch from the subassembly.

(c) REPLACEMENT OF HARMONIC AMPLIFIER.

1. REPLACEMENT OF ACCESS COVER PLATE.—To replace the cover plate for access to V201 and V202, fit holes of the plate to the corresponding mounting holes between the variable inductors referred to in the previous section, and tighten mounting screws to secure the cover plate to the subassembly plate.

2. REPLACEMENT OF SWITCHES S201 AND S202.—One switch is considered here. Replacement of the other switch follows the same steps as here outlined.

(1) Insert switch in the subassembly to fit the hole provided for it at the rear, and also to match its mounting holes against those on the projecting lip at the side of the subassembly.

(2) Solder all coded leads to the associated terminals of the switch.

(3) Connect the arm to the switch casting by tightening two screws through the arm to the casting. Position the arm to conform with the position of similar arms on the switches of adjacent subassemblies.

(4) Reconnect top and side plates to the subassembly.

3. REPLACEMENT OF HARMONIC AMPLIFIER SUBASSEMBLY

(1) Match the captive mounting screws of the harmonic amplifier subassembly to the corresponding mounting holes on the bottom of the lower deck, and secure the subassembly to the lower deck (see figure 6-3).

(2) Solder color-coded leads to associated capacitors C204, C231, C232, C235, C236, C237, C238, and C239, and also solder appropriate leads to feed-through terminals E201, E202, E203, and E204, and resistor R210 to feed-through terminal E205 (figure 5-39).

(3) Install the switch slide and bracket guides. The switch slide which controls switches of two other subassemblies simultaneously with those of the harmonic amplifier is properly installed when all the arms of the respective switches are inserted in the switch slide in the same relative position.

(4) Secure two bracket guides and the switch slide. Set the arms of the switching arrangement to correspond with the front panel BAND switch knob setting of 16-32 to ensure access to screws for securing the guides to the lower deck.

(5) Repeat steps *(7)* through *(10)* of paragraph 6-5*b*(2)*(c)3.*

(6) Lower the entire converter drawer to horizontal position and lock in place. Tilt upper deck 70 degrees.

(7) Reconnect P201 of coax cable W622 to jack J201.

(8) Lower upper deck so that both upper and lower deck are horizontal. Push the converter drawer into its housing and lock it in place.

(d) REMOVAL OF HARMONIC MIXER SUBASSEMBLY. (See figures 6-2 and 6-3.)

1. Pull out converter drawer from its housing, and tilt the upper deck 70 degrees.

2. Remove P251 of coax cable W610 from jack J251, and P252 of coax cable W611 from jack J252 (figure 5-39).

3. Lower the upper deck against the top of the lower deck, and tilt the combined converter unit 90 degrees to expose the bottom of the lower deck.

4. Remove two bracket guides and switch slide from the rear section of the harmonic mixer (and of related subassemblies, harmonic amplifier and HF oscillator).

5. Unsolder leads from feed-through capacitors C251, C264, C266, and C267, and leads from feed-through terminals E251, E252, and E253. Note color coding of leads for future reinstallation.

6. Loosen three captive mounting screws of the harmonic mixer and remove the subassembly from the lower deck.

(e) ADJUSTMENT AND REPAIR OF HARMONIC MIXER.

1. ACCESS TO V251—Removal of cover plate between adjustment screws of variable inductors L253 and L254 permits access to V251 for voltage and resistance measurements.

2. REMOVAL OF SWITCH S251.—S251 is a dual-wafer switch designed to insert bandchanging coils into the plate circuit of harmonic amplifier stage V202 and the grid circuit of harmonic mixer stage V251 respectively. Removal of the dual-wafer switch is similar to that of single-wafer switches previously described.

(1) With subassembly positioned as in figure 5-39, remove right side cover plate and also the hole plug at the left side plate. By removal of the hole plug, access is provided for previously inaccessible switch contacts.

(2) Unsolder all leads connecting to contacts of the ganged wafers. Code unsoldered leads for future reassembly.

(3) Remove arm connected to the switch casting at rear of subassembly by loosening two mounting screws securing the arm to the switch.

(4) Remove two screws securing switch casting to the left side of the subassembly adjacent to the hole plug.

(5) Move components away from the switch body and remove switch from subassembly.

(f) REPLACEMENT OF HARMONIC MIXER.

1. REPLACEMENT OF ACCESS PLATE.—The cover plate removed to gain access to V251 is replaced by returning it to its place between inductors L253 and L254 and tightening three mounting screws through the cover plate to the bottom plate of the subassembly.

2. REPLACEMENT OF SWITCH S251.

(1) Insert switch in the rear section of the harmonic mixer subassembly so that the circular portion of the switch casting fits into the hole at the rear provided for it, and so that mounting holes in the casting fit those in the left side plate adjacent to the hole plug, as shown in figure 5-39.

(2) Secure the switch casting to the left side plate.

(3) Mount arm to the switch casting at the rear, so that when the arm is properly installed, its projecting pin is positioned opposite to the mounting screw of the harmonic mixer compartment.

(4) Solder coded leads to associated contacts on wafers S251-1 and S251-2. The hole plug shown in figure 5-39 is removed to reach otherwise inaccessible switch contacts.

(5) Replace right side plate cover, and snap into place the plug for access hole on the subassembly's left side.

3. REPLACEMENT OF HARMONIC MIXER SUBASSEMBLY.

(1) Install harmonic mixer subassembly in its assigned position according to view shown in figure 6-3, and secure mounting screws to the bottom of the lower deck.

(2) Solder associated leads to feed-through capacitors C251, C264, C266, and C267. Also solder coded leads to feed-through terminals E251, E252, and E253 (figure 5-39).

(3) Install switch slide and bracket guides to fit the projecting pin of the switch casting arm. The switch slide also controls bandswitching of coils of the harmonic amplifier and HF oscillator. Therefore, adjust the settings of the respective arms of all three subassemblies to have the same relative position with respect to the switch slide. This ensures a proper fit between all the arms and switch slide, and also provides for identical band setting for the three sets of coils. Rotate front-panel BAND switch control to 16-32. This positions the bandswitch arms to permit easier access to the guide mounting screws.

(4) Lower the converter unit from its 90-degree position to a horizontal position, and lock it in place. Tilt the upper deck 70 degrees.

(5) Reconnect P251 of coax cable W610 to jack J251 and P252 of coax cable W611 to jack J252.

(6) Lower the upper deck until it rests horizontally against the top of the lower deck.

(7) Push converter unit into its housing and lock in place.

(7) INTERPOLATION OSCILLATOR MAINTENANCE.

(a) REMOVAL OF INTERPOLATION OSCILLATOR SUBASSEMBLY.

1. Pull out converter drawer, lock it in place, and tilt the upper deck of the unit 70 degrees.

2. Remove the interpolation oscillator cover from the top of the subassembly by removing four screws from the top of the lower deck (figure 6-2).

Note

> Exercise extreme care in removing the interpolation oscillator cover so as not to jar the variable capacitor plates.

3. Unsolder leads from feed-through terminals E401 and E402 (figure 5-42).

4. Lower the upper deck until it is horizontal against the top of the lower deck.

5. Tilt the entire converter drawer 90 degrees.

6. Unsolder power supply leads from feed-through capacitors C409, C412, and C415.

7. Remove P401 of coax cable W612 from jack J401 and P402 of coax cable W613 from jack J402.

8. Remove bottom plate from interpolation oscillator subassembly.

9. Loosen captive screws projecting through the top plate of the subassembly into the lower deck and remove the subassembly from the lower deck.

(b) ADJUSTMENT AND REPAIR OF INTERPOLATION OSCILLATOR.—Removal of components from the interpolation oscillator subassembly requires only conventional procedures and so does not merit special consideration. The same is true for adjustment and repair of components. By trouble-shooting procedures

indicated in Section 5, defective components are isolated for subsequent replacement or repair. Shorted plates in capacitors C401 and C406 (figure 5-42) can be separated, and the capacitors then readjusted to achieve correct frequency alignment (see paragraph 6-3*d*). If coils L401 and L402 become defective (open or shorted) replacement is recommended. In the case of L401, realignment is required on replacement according to procedure of paragraph 6-3*d*.

(*c*) REPLACEMENT OF INTERPOLATION OSCILLATOR SUBASSEMBLY.

1. Place the interpolation oscillator in its assigned position against the lower deck (figure 6-3) so that the captive screws of the top plate fit the corresponding mounting holes in the lower deck. Secure the subassembly to the lower deck.

2. Secure the bottom plate of the subassembly in position from which previously removed.

3. Reconnect P401 of coax cable W612 to jack J401 and P402 of coax cable W613 to jack J402.

4. Solder power supply leads to feed-through capacitors C409, C412, and C415.

5. Lower the converter unit to a horizontal position and lock it in place.

6. Tilt the upper deck 70 degrees to expose the top of the lower deck.

7. Solder associated leads to feed-through terminals E401 and E402.

8. Reinstall interpolation oscillator cover on top of the subassembly by tightening four mounting screws through lips on the cover to the top of the lower deck, figure 6-2). Exercise extreme care in reinstallation with respect to variable capacitor C608.

9. Lower the upper deck to the horizontal position against the top of the lower deck. Push the entire unit into the cabinet housing and lock it in place.

(8) CRYSTAL OSCILLATOR MAINTENANCE. —The crystal oscillator subassembly contains an oven amplifier, crystal oscillator, and frequency divider, and in addition contains an internal standard adjustment for precise setting of crystal oscillator frequency. Removal, adjustment, repair, and replacement are discussed in the following paragraphs as they apply to the crystal oscillator subassembly and its components with the exception of the internal standard adjustment, which will be treated separately in paragraph 6-5*d*(2).

(*a*) REMOVAL OF CRYSTAL OSCILLATOR SUBASSEMBLY. (See figures 6-4 and 6-5.)

1. Pull out and lock the converter drawer. The top of the crystal oscillator is now exposed from the top of the upper deck.

2. Remove P705 of coax cable W615 and P707 of coax cable W622 from jacks J705 and J707 located directly above the switch bracket at the front of the crystal oscillator subassembly (figure 5-55).

3. Raise the cover on the converter front panel.

4. Remove P709 of coax cable W621 from jack J709, located on the underside of the switch bracket at the front of the crystal oscillator subassembly.

5. Unsolder leads from the following feed-through capacitors located at the rear apron of the subassembly: C709, C710, C712, C714, C720, C731, C737, and C745. Note coding of leads for future reinstallation.

6. Turn four Dzus fasteners to the left to release the subassembly from its mounting on the upper deck, and remove the subassembly from the top section of the upper deck of the converter unit.

(*b*) REMOVAL OF CRYSTAL OVEN.—The crystal oven holds within its cylindrical container heating elements, a 1 mc crystal, auxiliary capacitors, and a thermal switch. The components and container comprise a complete individual unit, replaceable only as a unit. The following discussion is therefore limited to removal of this unit. (Figure 5-55 shows the oven in place in the subassembly.)

1. Remove top plate of the crystal oscillator subassembly by loosening ten screws from captive nuts in the lip at the top of the subassembly, and two screws from captive nuts in the top bend of the channel piece connecting to the oven.

2. Turn the crystal oscillator subassembly over to expose its bottom. Unsolder leads from feed-through terminals 1, 4, 5, and 7 of the bottom bend of the channel piece connecting to the oven. Code these leads to associate them with the appropriate terminals.

3. Remove three screws securing the oven to the rear apron and remove the oven unit from the crystal oscillator subassembly.

Note

> The crystal oven is mounted in a vacuum flask which is in turn inserted into the metal container shown in figure 5-55. Prior to insertion, the flask is encased in a shock-resistant insulating blanket which helps prevent heat loss and also provides a degree of physical protection. The items inside this container are extremely delicate, and require very careful handling.

(*c*) REMOVAL OF SWITCH S701.—FREQ. STAND. switch S701 becomes accessible when the front cover at the top of the converter unit is raised. Before removing the switch, the bracket subassembly must be removed.

1. Lift front cover of the top portion of the converter to expose the front apron and bracket subassembly of the crystal oscillator.

2. Remove the bracket subassembly from the front apron of the crystal oscillator chassis.

3. Unsolder leads from switch contacts. Code unsoldered leads for reinstallation.

4. Remove knob from the switch shaft.

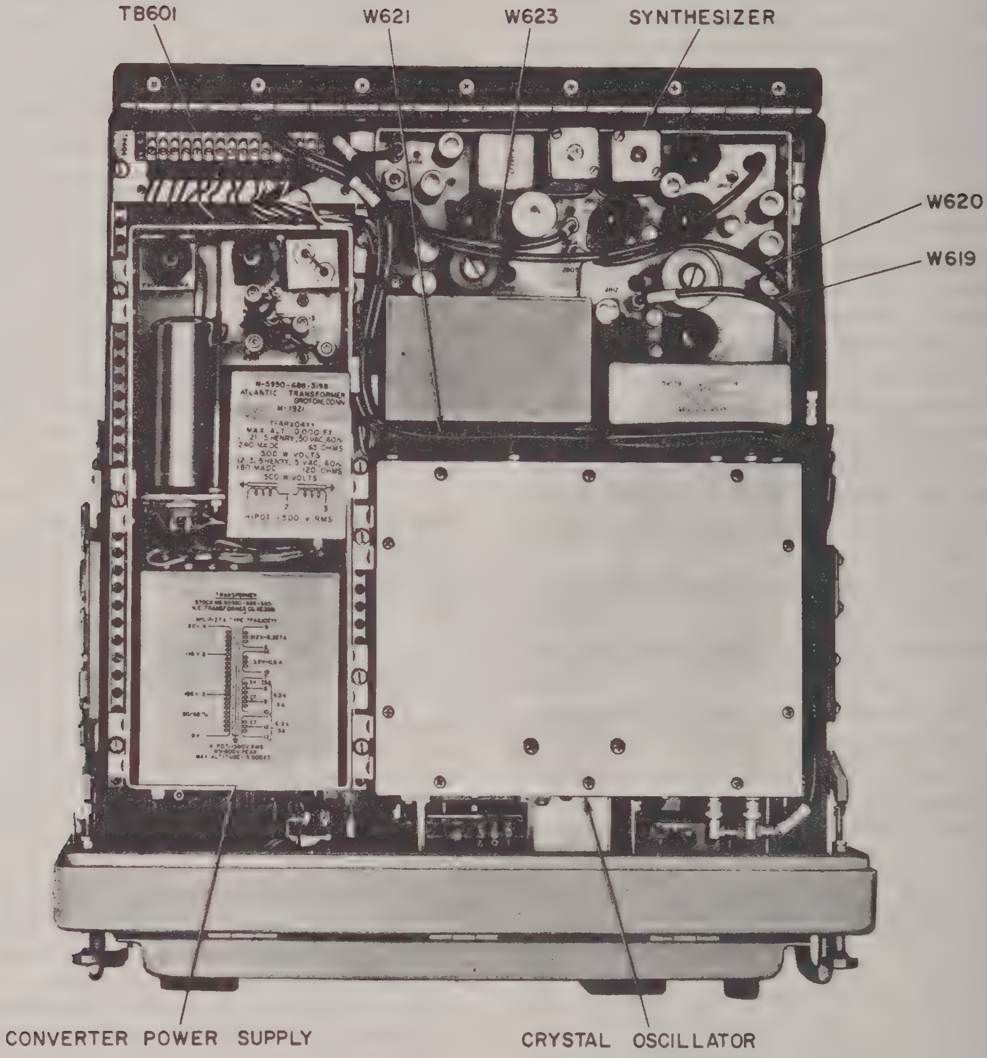


Figure 6-4. Converter Drawer, Upper Deck, Top View

5. Remove nut and washer from the threaded (and grooved) portion of the switch shaft, and remove switch from bracket.

(d) ADJUSTMENT AND REPAIR.—The crystal oscillator subassembly comprises two individual chassis with crystal oven between them, plus terminal boards for resistor and capacitor mounting. Parts are thus exposed for removal and replacement as necessary. If variable inductors of the functional subassembly become defective, replacement is recommended. (Refer to paragraph 6-3*a* for alignment of new inductors.) Likewise, should switch S701 become defective, replacement is in order. No mechanical adjustment is required in the crystal oscillator except for the INTERNAL STANDARD ADJUSTMENT, which will be considered in paragraph 6-5*d*(2).

(e) REPLACEMENT OF SWITCH.—The mounting bracket subassembly is assumed to be disconnected from the front apron of the crystal oscillator chassis.

1. Place FREQ. STAND. switch S701 within the bracket subassembly mounting hole provided.

2. Place the special washer over the threaded portion of the switch shaft so that the washer's inner

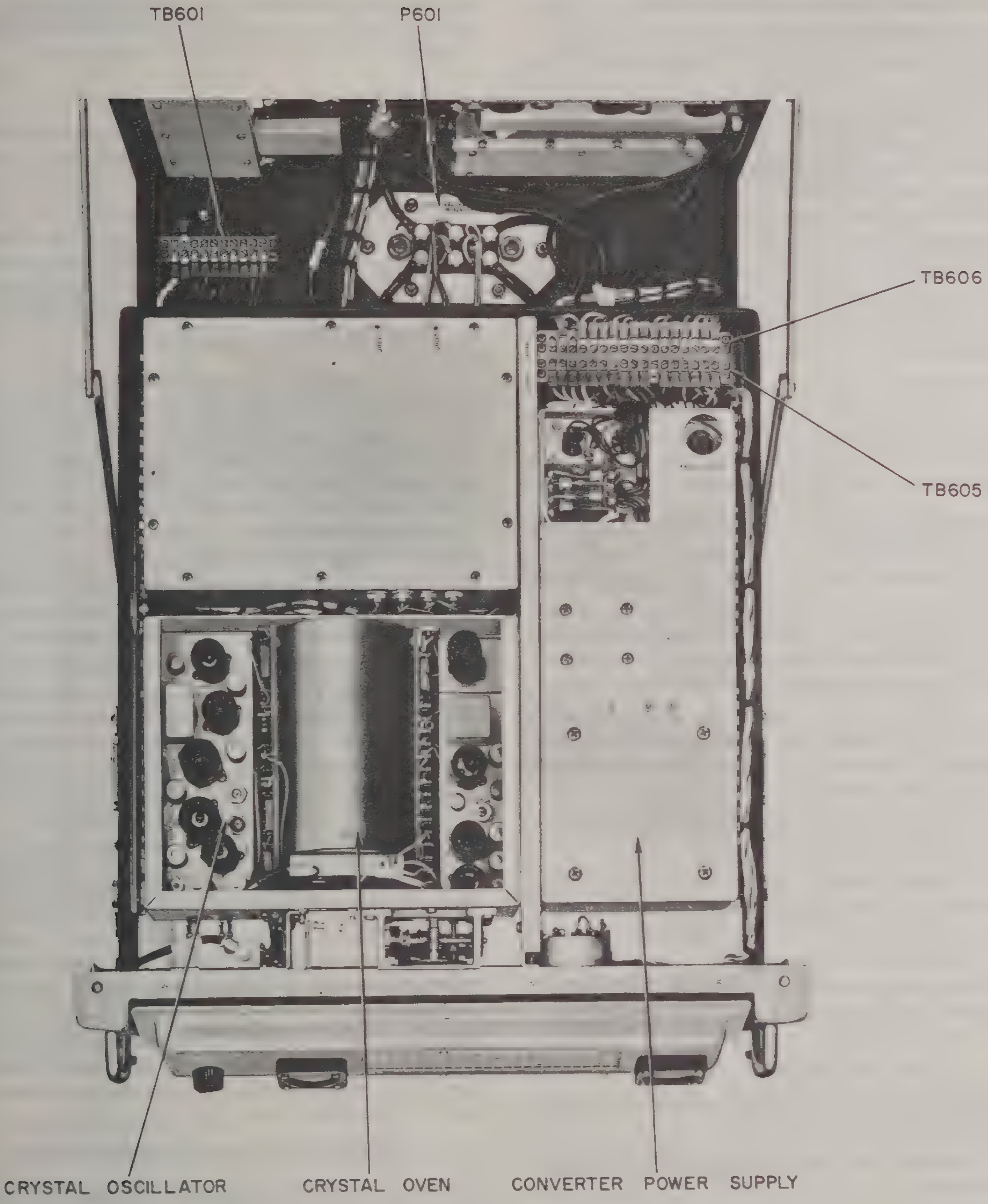

TB601
P601
TB606
TB605
CRYSTAL OSCILLATOR
CRYSTAL OVEN
CONVERTER POWER SUPPLY

Figure 6-5. Converter Drawer, Upper Deck, Bottom View

protrusion fits the groove in the thread. Also place the washer's outer extension through another hole in the bracket adjacent to the shaft hole, and secure the shaft o the bracket with a nut. The special washer ensures positioning the replacement switch identically to the original switch.

3. Solder all coded leads to the associated terminals of switch.

4. Replace knob on switch shaft, making sure that the knob pointer indication on the bracket corresponds with the actual setting of the switch.

5. Secure switch bracket subassembly to the front apron of the crystal oscillator chassis.

(f) REPLACEMENT OF CRYSTAL OVEN.—Prior to replacement of the crystal oven, refer to NOTE of 6-5*b*(8)*(b)*.

1. Place the crystal oven into the space between the terminal boards of the crystal oscillator subassembly so that the mounting holes in its rear mate with corresponding mounting holes in the rear apron of the crystal oscillator. Secure the oven to the apron with three mounting screws.

2. Turn the crystal oscillator subassembly to expose its bottom. Solder coded leads to feedthrough terminals 1, 4, 5 and 7 of the bottom bend of the channel piece connecting to the oven.

3. Install top cover plate by inserting ten screws through the cover to corresponding captive nuts on the top lips of the subassembly and tightening. Do likewise for the two additional mounting holes on the upper lip of the channel piece connecting to the oven.

(g) REPLACEMENT OF CRYSTAL OSCILLATOR SUBASSEMBLY.

1. Place the crystal oscillator subassembly in the space assigned for it on the upper deck of the converter so that the subassembly's Dzus fasteners are positioned with corresponding fittings on the converter chassis. Secure the subassembly in place.

2. Solder coded leads to the following feedthrough capacitors located at the rear apron of the crystal oscillator subassembly: C709, C710, C712, C714, C720, C731, C737, and C745.

3. Raise the cover at the top of the converter front panel.

4. Reconnect P709 of coax cable W621 to jack J709, located on the underside of the switch bracket at the oscillator front apron.

5. Reconnect P705 of coax cable W615 and P707 of coax cable W622 to jacks J705 and J707, located directly above the switch bracket at the oscillator front apron.

6. Close and lock converter drawer.

(9) FREQUENCY DIVIDER MAINTENANCE. (See figure 6-2.)

(a) REMOVAL OF FREQUENCY DIVIDER SUBASSEMBLY.

1. Pull out converter drawer and lock it. Tilt the upper deck to 70 degrees to expose the top of the frequency divider subassembly.

2. Unsolder power leads from feed-through capacitors C455, C464, and C465 (figure 5-58).

3. Remove P451 of coax cable W615 from jack J451 and P455 of coax cable W616 from jack J455.

4. Loosen four captive mounting screws and remove the subassembly. The two forward mounting screws, located on the bottom plate of the subassembly, are reached by inserting a screw driver through holes at either end of the forward part of the frequency divider chassis.

Note

> If access to the bottom of the subassembly for trouble shooting otherwise inaccessible sections is desired, follow the above procedure to the extent necessary to gain access to the bottom plate for its removal. Therefore, apply only steps 1, 3, and 4, after which disconnect the bottom plate from the subassembly by removing two screws from the subassembly's forward apron.

(b) REMOVAL OF TOP COVER.—The top back section of the frequency divider subassembly contains a vertical partition (with sides) projecting above chassis level and supporting terminal boards with circuit components. This is in turn enclosed by an L-shaped cover which fits over the top and front, and which secures to the subassembly by means of two mounting screws through holes in lips projecting upward from the chassis level. When required to check components within this section, release the cover by removing the two screws from the front directly above chassis level.

(c) ADJUSTMENT AND REPAIR OF FREQUENCY DIVIDER.—Components of this subassembly are easily reached and, with top cover and bottom plate removed, present no problem regarding their removal and replacement. Terminal board installation permits ready access to individual components, both from top and bottom of the subassembly.

(d) REPLACEMENT OF TOP COVER.—The top cover is replaced by tightening screws through the cover into the two front mounting holes just above the chassis level.

(e) REPLACEMENT OF BOTTOM COVER.—The bottom plate is placed so that its lip with mounting holes is on the front side of the subassembly, corresponding with the holes on the subassembly front apron. When correctly installed, the captive screws of the bottom plate are positioned under the access holes at either end of the chassis front.

(f) REPLACEMENT OF SUBASSEMBLY.

1. Position subassembly on top of the lower deck chassis in the place assigned for it so that its four captive mounting screws fit over corresponding mounting holes in the lower deck chassis. Secure the subassembly in place.

2. Reconnect P451 of coax cable W615 to jack J451 and P455 of coax cable W616 to jack J455.

3. Solder power leads to feed-through capacitors C455, C464, and C465.

4. Close and lock converter drawer.

(10) SYNTHESIZER MAINTENANCE.

(a) REMOVAL.

1. REMOVAL OF SYNTHESIZER SUBASSEMBLY.

(1) Pull out converter drawer and lock it in place. Tilt the upper deck 70 degrees to expose the bottom of the upper deck and the synthesizer subassembly (figure 6-5).

(2) Unsolder coded leads from feed-through capacitors C803, C815, C830, and C832.

(3) Lower the upper deck to its horizontal position against the top of the lower deck. This exposes the top of the upper deck for removal of coax cables and for loosening of Dzus fasteners of the subassembly.

(4) Remove the following plugs from jacks of the synthesizer subassembly: P801 of coax cable W616 from jack J801; P804 of coax cable W623 from jack J804; P805 of coax cable W620 from jack J805; P811 of coax cable W619 from jack J811; and P815 of coax cable W617 from jack J815.

(5) Loosen captive Dzus fasteners, remove bracket from apron of converter power supply, and remove the synthesizer subassembly from the top of the converter drawer upper deck.

2. REMOVAL OF BOTTOM PLATE. — To remove the bottom plate, pull out the converter, tilt the upper deck 70 degrees and, with the bottom of the synthesizer subassembly exposed, loosen ten captive screws and remove the bottom plate.

(b) ADJUSTMENT AND REPAIR OF SYNTHESIZER.—Test points, and most of the components of the synthesizer can be reached easily either from the top of the subassembly or from the bottom, with the bottom plate removed. There are, however, several top-mounted components whose terminal connections extend through to the underside of the subassembly chassis. Due to the positioning of three component terminal boards also located on the underside of the synthesizer subassembly (figure 5-65), these terminal connections become inaccessible. The terminal boards must be loosened and moved as required for an operator to gain access to the connections for check or replacement of the component.

(c) REPLACEMENT.

1. REPLACEMENT OF BOTTOM PLATE.—Place the plate on the lip of the subassembly bottom so that holes in the plate clear test points J806, J807, and J809. Tighten ten screws through mounting holes in plate and subassembly.

2. REPLACEMENT OF SYNTHESIZER SUBASSEMBLY.

(1) Set the synthesizer subassembly into place at the top of the upper deck in accordance with figure 6-4, and secure the subassembly to the upper deck.

(2) Connect plug P801 of coax cable W616 to jack J801; P804 of coax cable W623 to jack J804; P805 of coax cable W620 to jack J805; P811 of coax cable W619 to jack J811; and P815 of coax cable W617 to jack J815. Also secure bracket to apron of converter power supply to contain coax cables in place between synthesizer and power supply.

(3) Tilt the upper deck 70 degrees to expose the bottom of the subassembly.

(4) Solder coded leads to feed-through capacitors C803, C815, C830, and C832.

(5) Lower the upper deck to rest horizontally against top of lower deck. Push the converter drawer into its cabinet housing and lock it in place.

(11) CONVERTER UNIT POWER SUPPLY MAINTENANCE.

(a) REMOVAL.

1. REMOVAL OF CONVERTER POWER SUPPLY SUBASSEMBLY.

(1) Pull out converter drawer and lock it. Tilt the upper deck 70 degrees.

(2) Remove connecting lugs of the converter power supply cable from terminal board TB605, which becomes accessible on tilting the upper deck as noted in figure 6-5. Code leads for future reinstallation.

(3) Lower upper deck to horizontal position against top of lower deck.

(4) Unlock Dzus fasteners of the power supply subassembly, and remove the subassembly from the top section of the upper deck.

2. REMOVAL OF POWER SUPPLY COMPONENTS.—The converter power supply subassembly contains sizable components which can be removed readily for check or replacement. Due to the compact layout of adjacent components, it becomes necessary in certain instances to elevate a particular component from its seating in order to disconnect leads from it. This applies both to power transformer T901 and filter choke L901, as noted below.

(1) To remove power transformer T901, remove four screws from holes at the bottom of the power supply subassembly where the power transformer is secured. (The upper deck is assumed tilted 70 degrees.)

(2) Lower the upper deck to horizontal position. Pull the transformer out from its seating, unsolder the leads from the terminal block at the top of the transformer, and remove it from the subassembly. Note coding of leads for future reinstallation. Moving filter choke L901 back from its seating makes leads to transformer more accessible. See step 3 below.

(3) To remove filter choke L901 (with the power transformer installed in place), remove four screws from the bottom of the power supply subassembly to which the choke secures, and elevate the choke sufficiently to get at the terminal connections for unsoldering. (The upper deck is tilted 70 degrees to get at the screws.)

(4) Lower upper deck. Unsolder leads from the filter choke and remove it from the power supply

subassembly. Note coding of leads for future reinstallation.

(5) To remove socket plug-in type capacitors C901 and C902 (figure 5-3), remove the top securing caps and pull the respective filter cans from the plug-in sockets.

(6) Semiconductor diodes CR901, CR902, CR903, and CR904 are soldered to terminal connections on the terminal board at the bottom (open) area of the power supply subassembly. When the subassembly is removed from the converter unit, access to the diodes is attained by simply turning the subassembly so that its bottom is exposed. When the subassembly is mounted in place in the converter unit, access is likewise easily gained by tilting the upper deck to its 70-degree position to expose the bottom of the subassembly.

Note

> Take proper precaution in removing from the terminal board any of the diodes mentioned above. To avoid overheating the semiconductor material when unsoldering the diode lead from the terminal connection, clamp the lead between the semiconductor and soldering iron with long-nosed pliers.

(b) ADJUSTMENT AND REPAIR OF CONVERTER POWER SUPPLY. — The converter power supply subassembly is conventional in construction and requires no mechanical adjustment. Repair is limited to replacement of defective components except for the possible repair of power leads at the "squeeze-fit" lug end.

(c) REPLACEMENT OF CONVERTER POWER SUPPLY.

1. REPLACEMENT OF POWER SUPPLY SUBASSEMBLY.

(1) Set the converter power supply subassembly into place from the top of the upper deck of the converter and secure to the upper deck by means of the Dzus fasteners of the subassembly. Tilt the upper deck 70 degrees.

(2) Connect converter power supply cable leads to TB605 by connecting lugs of the coded leads to the appropriate corresponding terminals on TB605.

(3) Lower the upper deck to horizontal position, return the converter drawer to its cabinet housing, and lock it in place.

2. REPLACEMENT OF COMPONENT PARTS.

(1) Place power transformer T901 in vicinity of its permanent seating in the converter power supply subassembly, so that connecting leads reach the terminal connections of the transformer to which they are to be soldered. Move the filter choke L901 as necessary to gain access to the terminals for soldering.

(2) Solder coded leads to associated terminals of the transformer terminal block.

(3) Set the transformer in its proper place and secure to the subassembly by tightening screws through the clearance holes on the underside of the subassembly to the threaded holes of the bottom of T901, with the upper deck tilted 70 degrees.

(4) Perform steps similar to *(1)* through *(3)* for replacement of filter choke L901, with due regard for proper seating and correct connections of coded leads.

(5) Replace filter capacitor cans by inserting them into the respective plug-in sockets and securing the top caps to the capacitors.

(6) Replace semiconductor diodes CR901, CR902, CR903, and CR904 by soldering the semiconductors to appropriate terminals on the terminal board visible in the exposed space at the bottom of the power supply subassembly. Exercise care in soldering the semiconductor leads to the terminal board connections, and apply technique suggested in NOTE to step 6 of 6-5*b* (11)*(a)2*.

(12) CONVERTER BLISTER MAINTENANCE. —The converter blister consists of a group of cable connectors mounted on beveled framework bolted to an auxiliary panel which in turn is secured to the back of the converter cabinet (figures 5-75 and 6-6). The panel connects to the cabinet rear by means of eight fasteners which fit grooves of mounting posts to which they secure. In addition to the cable connectors mentioned above, the auxiliary panel contains two components for transfer of signals and ac power between the converter and demodulator drawers. Withdrawing the converter drawer from its housing breaks contact between signal transfer circuits of the upper and lower drawers (demodulator and converter), but permits the converter drawer to retain ac power through use of a power cable wrapped around a spring-loaded cable drum slip ring arrangement as shown in figure 5-75. The following information refers to removal, adjustment, repair and reinstallation of the subassembly and the aforementioned components.

(a) REMOVAL.

1. REMOVAL OF CONVERTER BLISTER PANEL.

(1) Pull out the converter unit. This withdrawal separates multiple-connection plug P951 from jack J951 and automatically removes signal transfer connections between converter and demodulator drawers.

(2) Remove the converter drawer from the receiver proper as authorized in Section 2.

CAUTION

> The weight of the converter drawer approximately 135 pounds) requires at least two men to safely remove or replace it.

(3) Loosen the panel from the securing posts at the rear of the cabinet by releasing the fasteners.

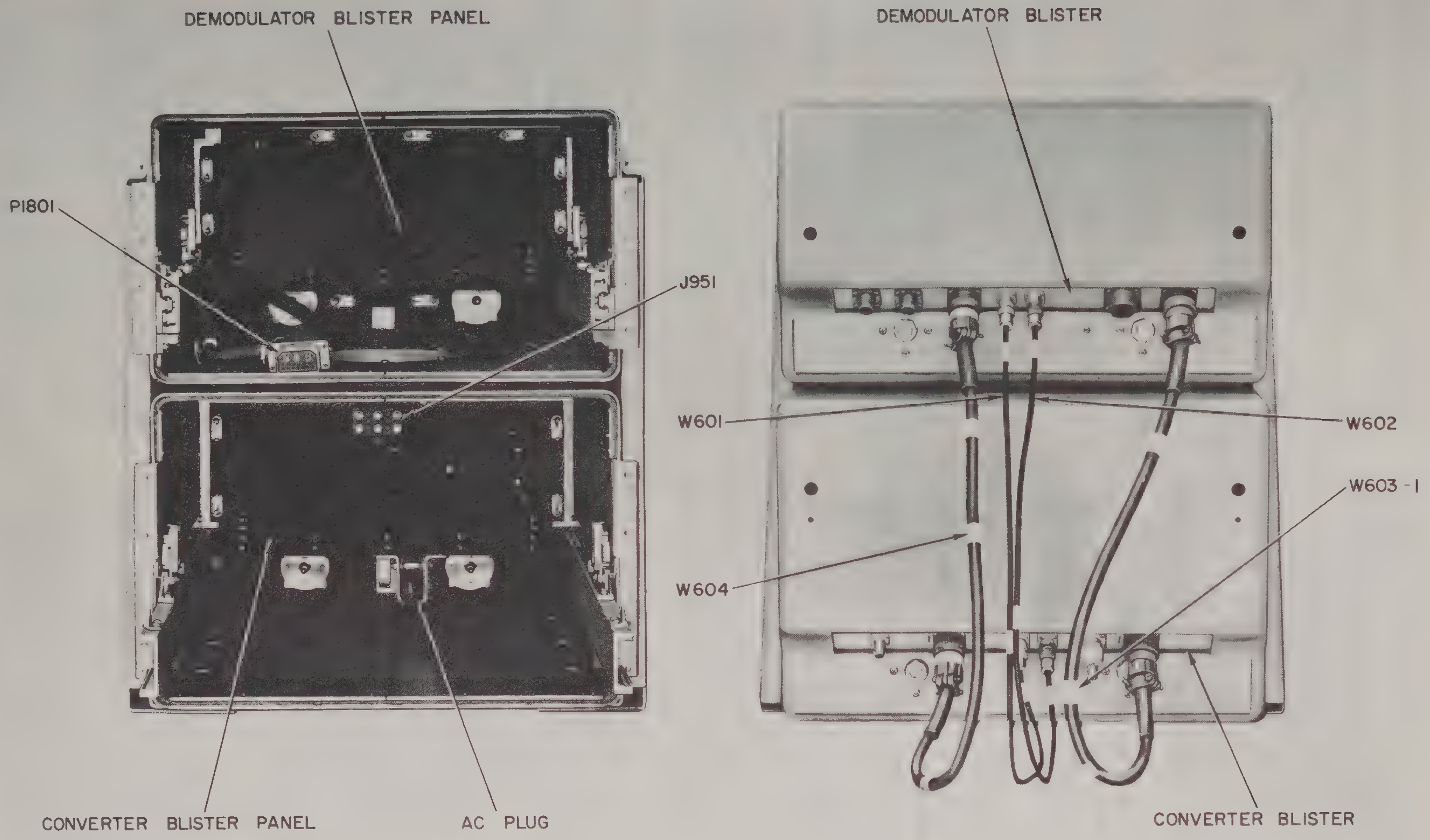

DEMODULATOR BLISTER PANEL
P1801
J951
CONVERTER BLISTER PANEL
AC PLUG
DEMODULATOR BLISTER
W601
W602
W603-1
W604
CONVERTER BLISTER

Figure 6-6. Converter and Demodulator Blisters

(4) Tilt the panel to expose the cable connectors at the back.

(5) Separate the following cable connectors: (1) P952 of cable W621 from J952; (2) P953 of cable W601 from J953; (3) J954 of cable W602 from J954; (4) P956 of cable W603 from J956; (5) P957 of cable W605 from J957; and (6) P958 of cable W604 from J958 (figure 5-75).

(6) Remove the panel from the cabinet.

2. REMOVAL OF CONVERTER BLISTER REEL.

(1) Remove reel holding screw from the front of the blister.

(2) Remove screw from threaded shafting above the holding bracket at the rear of the blister front panel.

(3) Remove the reel holding bracket by removing screws from bracket lip, and also the screw securing the bracket to the support post at the opposite end from the bracket lip.

(b) ADJUSTMENT AND REPAIR OF CONVERTER BLISTER.

1. SLIP RINGS.—The blister reel has slip rings which make contact with brushes externally connected to the ac line. Poor contact with the brushes causes unreliable operation of the ac input to the converter unit when it is pulled out from the cabinet. When this occurs, remove the reel from its mounting and clean the rings with an approved solvent. Also make sure that the brush contacts are clean.

2. SPRING LOADING.—The line ac cable is kept taut by the spring loading effect of the reel. If operation of the reel becomes sluggish and the spring loading needs adjusting, first remove the female twist-lock ac plug from the cable end. Release the cable end from its enclosure on the blister back panel and rotate the movable part of the reel with the cable so as to increase the torque applied to the loading spring. While doing this, hold the top plate of the reel stationary, and keep inserting the excess length of cable in between the support post and the apron of the holding bracket. When sufficient torque has been established, reinsert the cable into the enclosure referred to above and reconnect the female twist-lock ac plug to the cable.

(c) REPLACEMENT.

1. REPLACEMENT OF CONVERTER BLISTER REEL.

(1) Place reel over the hole of the brush holder on the back of the blister panel so that brushes fit against the slip rings.

(2) Secure reel to panel with center screw from front of blister panel.

(3) Place holding bracket on top of the reel at back of blister panel so that the mounting hole on the beveled end fits the hole of the support post, the holes in the bracket lip fit corresponding panel holes, and the center hole on the bracket fits over the reel shaft.

(4) Secure the holding bracket to the support post, reel shaft, and blister panel.

2. REPLACEMENT OF CONVERTER BLISTER.

(1) Ease the blister panel into place so that it is close enough to the rear cables to permit reconnecting them.

(2) Connect signal transfer and power cables between demodulator and converter cabinets.

(3) Move the blister panel back, align it with fasteners and secure it in place.

(4) Reinstall converter drawer; close and lock it.

(13) ALIGNMENT AND GANGING OF CAPACITORS. (See figure 6-7.)—The following instructions cover alignment of the harmonic-amplifier capacitor with the MEGACYCLE counter and ganging the capacitors of the preselector and the harmonic amplifier. Numerals in parentheses identify items shown in figure 6-7.

(a) ALIGNING HARMONIC-AMPLIFIER CAPACITOR WITH COUNTER.

1. Turn the shaft of the band-change detent assembly (1) fully clockwise. Rotate the MEGACYCLE counter assembly (2) until the 16-32 mc counter appears through the bezel (3). (The 16-32 mc counter is the one with the smallest pinion gear.)

2. Remove the bezel (3), so that all four digits of the MEGACYCLE counter are visible.

3. Couple the harmonic-amplifier capacitor assembly (4) to the MEGACYCLE counter assembly (2) by means of the shaft coupling (5), the intermediate shaft (6), and the flexible shaft coupling (7).

4. Using a 6-inch metal rule (or similar piece of straight-edged metal) and an ohmmeter (Multimeter AN/PSM-4B), short out the rotor and stator plates of the oscillator section of the capacitor at that point on the toe of the stator plates nearest the hub of the rotor.

5. Loosen the set screw on the pinion gear of the 16-32 mc counter and hand-set the counter to read 1511. Retighten the set screw.

6. Rotate the Mc panel knob clockwise until the counter reads 1558.

7. Loosen the hex-head screw on the upper spur gear (8) at the rear of the counter frame. Rotate all stop rings (9) fully counterclockwise and adjust the lower spur gear (10) so that its stop pin touches the dog (11) on the rear stop ring. Tighten the hex-head screw. Now when the Mc knob is rotated fully clockwise, the counter should read 3260.

8. With the Mc knob, set the counter to 1600. Rotate the BAND change knob counterclockwise, one position at a time, and at each position loosen the set

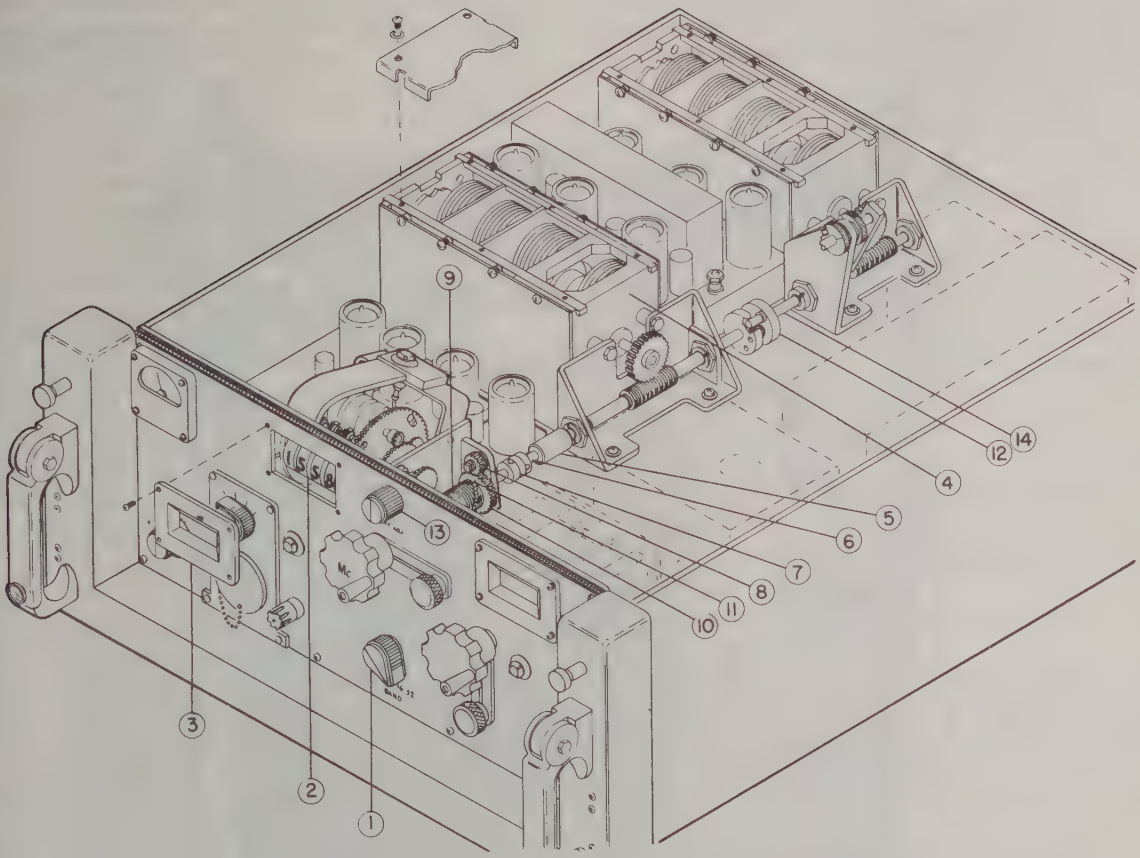


Figure 6-7. Converter Drawer, Main Tuning Mechanism

screw of the counter in bezel position and hand-set as follows:

Band	*Set counter at*
8-16	0800
4-8	0400
2-4	0200

(*b*) GANGING HARMONIC-AMPLIFIER AND PRESELECTOR CAPACITORS.

Note

> The harmonic-amplifier capacitor and the counter must be aligned before this operation is performed.

1. Set the BAND selector switch to 16-32.

2. Rotate the Mc knob counterclockwise as far as it will go. The counter will read 1558.

3. Remove the flexible coupling (12) from between the harmonic amplifier and preselector capacitors.

4. Turn the HF. ADJ. knob (13) fully clockwise.

5. Again using a metal straightedge and ohmmeter, set and short the preselector capacitor in mesh position by rotating the worm-gear shaft (14).

6. Reinstall flexible coupling between the two capacitors and tighten the set screws on the flats.

Note

> If the flats do not line up, change the stops on the HF. ADJ. shaft until the flats do line up — with the capacitor set correctly and the HF. ADJ. shaft fully clockwise. If one stop on the HF. ADJ. shaft is moved, the other must be reset in order to limit the shaft to one revolution.

7. Replace the bezel and any other hardware.

c. DEMODULATOR UNIT MAINTENANCE.

(1) 80 KC IF FILTER. (See figure 6-8.)

(*a*) REMOVAL.

1. Pull out and lock demodulator drawer. Tilt the upper deck to 85 degrees to expose the top of the lower deck and the top part of the 80 kc IF filter.

2. Remove P1301 of coax cable W651 from J1301, P1302 of coax cable W653 from J1302, and P1303 of coax cable W654 from J1303 (figure 5-25). Access to the jacks is from the top of the lower deck. Also unsolder leads from feed-through capacitor C1302.

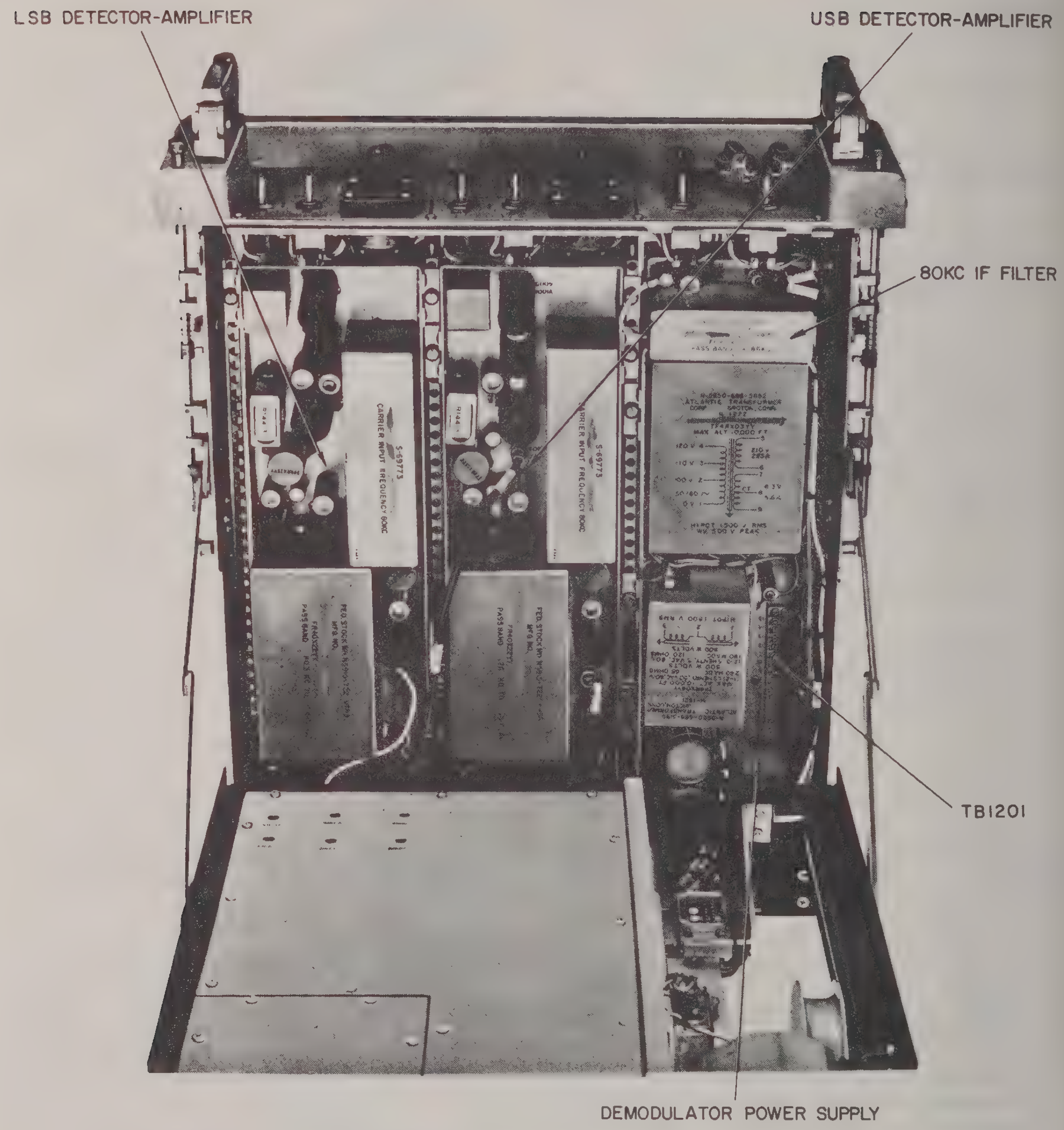

LSB DETECTOR-AMPLIFIER
USB DETECTOR-AMPLIFIER
80KC IF FILTER
TB1201
DEMODULATOR POWER SUPPLY

Figure 6-8. Demodulator Drawer, Lower Deck, Top View

3. Twist the Dzus fasteners of the subassembly to the left to detach it from the chassis. Remove the filter unit from the lower deck.

(b) ADJUSTMENT AND REPAIRS.—The 80 kc IF filter unit has mounted on its chassis a 12 kc bandwidth filter (FL1301) which, if found defective, is to be replaced by a new one. The other components of the unit, including variable trimmer capacitors, feedthrough capacitor, screwbase capacitor and resistors are readily accessible on removal of the bottom plate of the unit (from the bottom side of the lower deck) and can be removed and replaced when the need arises.

(c) REPLACEMENT.

1. Place the filter unit on top of the lower deck chassis at right front (just back of front panel) so that its Dzus fasteners mate with corresponding fittings on the chassis. Secure the unit in place.

2. Reconnect P1301 to J1301, P1302 to J1302, and P1303 to J1303. Also resolder leads to feed-through capacitor C1302.

3. Close and lock demodulator drawer.

(2) AM DETECTOR-AMPLIFIER.

(a) REMOVAL OF AM DETECTOR-AMPLIFIER SUBASSEMBLY. — The AM detector-amplifier functional subassembly located on the upper deck of the demodulator unit is complete in itself, and can be removed from the demodulator unit with its front panel intact and with control and switch shaft knobs likewise untouched (figure 5-33). The bottom of the unit is closed by a cover plate, whereas the top, except for the isolated BFO section, is exposed, with the components on the top part readily accessible.

1. Pull out and lock demodulator drawer.

2. Remove P1601 of coax cable W654 from J1601.

3. Remove all leads from terminal board TB-1601. Note coding of leads for reinstallation.

4. Twist Dzus fasteners of the detector-amplifier to the left to release the subassembly. Remove the subassembly from the demodulator unit.

(b) REMOVAL OF R.F. SELECTIVITY BW-KCS SWITCHES S1601-1602.—The detector-amplifier is assumed to be removed from the demodulator unit during removal of these and other switches from this subassembly. This assumption only serves to simplify the following procedure, and is not a preliminary requisite, since the procedure can be carried out with the subassembly in the demodulator unit provided that the subassembly is properly positioned for ready access to the various switches to be removed.

1. Turn the subassembly bottom up and remove the cover plate to expose switches S1601 and S1602 at the rear right area of the subassembly (figure 5-33).

2. Loosen coupling connecting the extension rod to the shaft of the forward switch (S1602). Move the extension rod forward to release coupling from shaft of S1602.

3. Loosen coupling which joins shafts of both switches and which is located in the enclosed space between the two vertical support plates shown in figure 5-33. Move coupling back over the shaft of switch S1601 until it is clear of S1602.

4. Remove nut and washer from S1602 and lift switch to expose all connections for unsoldering leads.

5. Unsolder all leads to electrical connections on switch S1602. Code leads for reinstallation. Remove the switch.

6. Loosen nut, and remove nut and washer from shaft of S1601.

7. Unsolder all leads from electrical connections to the switch, and code the leads. The switch is to be moved from its plate support to expose connections. Remove switch S1601.

(c) REMOVAL OF B.F.O. SWITCH S1604.

1. Remove top cover of BFO section at front right of the AM detector-amplifier (figures 5-33 and 6-10).

2. Remove front panel knob from B.F.O. switch shaft.

3. Remove nut and washer from shaft threading of switch S1604.

4. Unsolder leads from switch S1604. With nut and washer removed from its shaft, the switch can be moved inward from the front panel or rotated as required for unsoldering of all leads.

5. Remove switch S1604 from the front panel of the BFO section.

(d) REMOVAL OF A.M.-A.G.C. TIME CONST. SWITCH S1605.

1. Remove front panel knob from A.M.-A.G.C. TIME CONST. switch shaft.

2. Remove nut and washer from shaft threading of switch S1605.

3. Unsolder leads from switch S1605, and code them. The switch is to be moved outward, or rotated to facilitate unsoldering. (Access to the lead is from bottom with cover removed.)

4. Remove switch S1605 from the front panel of the subassembly.

(e) ADJUSTMENT AND REPAIR.—All components of the AM detector-amplifier are exposed upon removal of the bottom plates of the subassembly and the top and bottom covers of the BFO section. Removals, except for the switches, are of a routine nature. Bandpass filters, located at the rear of the subassembly and also just forward of V1601 (figure 5-33) are easily removed and replaced if they become defective, as are panel-mounted controls. In cases where terminal board installations hinder access, the terminal boards can be loosened and tilted to permit access. If bandpass filter FL1601 is replaced, perform the following:

1. Condition the receiver for A-1 reception.

2. Place RF SELECTIVITY BW-KCS switch to the .350 position.

3. Advance RF GAIN control to obtain a convenient noise output indication on LINE A OUTPUT meter. This reading will be used as a reference point for the remainder of this procedure. Do not touch RF GAIN control for the remainder of this procedure.

4. Place RF SELECTIVITY BW-KCS switch to the 1.0 position. Check the LINE A OUTPUT meter indication. If the reading is within 6 decibels of the reference reading proceed to step 5. If the reading is not within 6 decibels of the reference reading adjust the value of R1606 or R1608 until the reading comes within the 6 decibel limit. Use ½ watt standard preferred resistors when making this adjustment.

5. Place RF SELECTIVITY BW-KCS switch to the 3.0 position. Check LINE A OUTPUT meter indication. If the reading is not within 6 decibels of the reference reading, adjust the value of R1605 until the reading comes within the 6 decibel limit.

6. Place RF SELECTIVITY BW-KCS switch to the 12.0 position. Again check the LINE A OUTPUT meter indication. If the reading is not within 6 decibels of the reference reading, adjust the value of R1609 until this reading comes within the 6 decibel limit.

(f) REPLACEMENT OF A.M.-A.G.C. TIME CONST. SWITCH.

1. With bottom cover removed and bottom exposed, insert switch S1605 into its hole on the subassembly front panel.

2. Insert washer and nut over the shaft, threading it loosely to permit movement of the switch for soldering leads.

3. Solder coded leads to switch contacts.

4. Set washer into front panel hole adjacent to the shaft mounting hole, and tighten nut to secure shaft to panel.

5. Replace front panel knob on shaft of switch, making sure that the switch setting corresponds to the front panel marking to which the knob pointer is directed.

(g) REPLACEMENT OF B.F.O. SWITCH.

1. Insert switch S1604 into its hole above the B.F.O. marking on the front panel.

2. Thread washer and nut loosely on the shaft. The loose fit permits free movement of the switch for soldering of leads.

3. Solder coded leads to switch contacts.

4. Fit washer to front panel hole adjacent to the shaft mounting hole. Tighten nut to secure shaft to front panel.

5. Connect front panel knob to shaft of switch. Make sure that the actual switch setting corresponds with the front panel indication to which the knob pointer is directed.

(h) REPLACEMENT OF R.F. SELECTIVITY BW-KCS SWITCHES.

1. With bottom plate removed, install switch S1601 on the back plate support under the subassembly. Insert washer and nut on switch shaft and tighten only enough to keep the switch in place and yet allow movement of the switch for soldering of leads.

2. Solder coded leads to switch contacts.

3. With washer properly positioned, tighten nut to secure shaft to back plate.

4. Install switch S1602 on the front plate support, forward of S1601, in same manner as described in step *1.*

5. Solder coded leads to its contacts.

6. Join switches S1601 and S1602 by means of the coupling shown in figure 5-33.

7. Connect extension rod to S1602 with the coupling shown in same figure of step *6.*

Note

In installing switches S1601 and S1602, make sure that the switches track with each other, so that both switches are simultaneously set for the identical mode of operation. Also make sure, after connecting the extension rod with its front panel knob, that the knob pointer indicates the particular mode for which the switches are actually set.

8. Tighten nut to secure switch S1602 to the front plate support, and tighten all couplings to their respective shafts. Also secure switch S1601 to rear plate support.

(i) REPLACEMENT OF AM DETECTOR-AMPLIFIER SUBASSEMBLY.

1. Fasten bottom plates to the underside of the subassembly (including the BFO section).

2. Fasten top cover plate to top of BFO.

3. Place the subassembly on the top side of the upper deck of the demodulator unit and secure in place.

4. Connect all coded leads to terminal board TB1601.

5. Connect P1601 of cable W654 to J1601.

6. Close and lock demodulator drawer.

(3) USB DETECTOR-AMPLIFIER. (See figures 6-8 and 6-9.)

(a) REMOVAL.

1. Pull out demodulator drawer and tilt it 90 degrees.

2. Remove connections from terminal board TB1001, located on the bottom lip of the forward apron of the subassembly (figure 5-49).

3. Unsolder leads from feed-through capacitor C1033, located on the front apron of the subassembly. Note coding of unsoldered leads for reinstallation. Do likewise for feed-through capacitors C1001, C1002, C1015, and C1024 at rear apron of the subassembly.

4. Lower the drawer to the horizontal position, lock it and tilt the upper deck to 85 degrees.

5. Remove P1001 of cable W653 from J1001, P1002 of cable W655 from J1002, and P1003 of cable W656 from J1003.

6. Remove knob from shaft of front panel A.F. LEVEL LINE A control (R651), and remove the control itself from the demodulator front panel (see figure 3-1).

7. Twist Dzus fasteners of the subassembly to the left to release it from the lower deck. Remove the subassembly from the drawer.

(b) ADJUSTMENT AND REPAIR.—No mechanical adjustments are required for the USB detector-amplifier. On removal of the bottom plate of the subassembly, components, with the exception of bandpass fil-

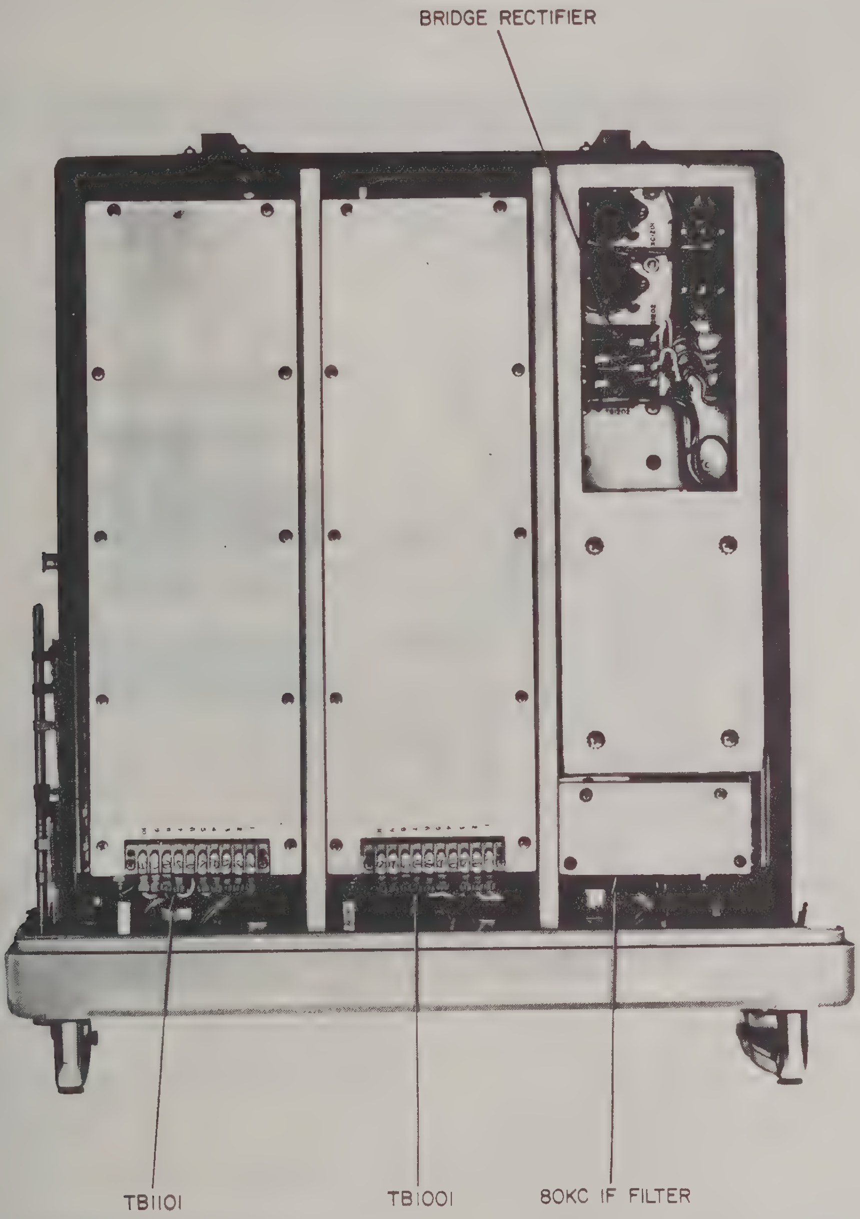


Figure 6-9. Demodulator Drawer, Lower Deck, Bottom View

ter FL1001 and USB demodulator Z1001, are readily removed and replaced as required. To get at unit Z1001 for removal (and replacement), remove mounting screws from terminal board TB1004, and move the board sufficiently to permit loosening of the unit from the underside of the subassembly. If necessary, unsolder from the board (and code) any leads which hinder its movement. On completion of removal and replacement of Z1001, resolder these leads and secure the board in place. Follow the same procedure for removal and replacement of bandpass filter FL1001. In this case, loosen terminal boards TB1002 and TB1003, and move them aside as necessary.

(*c*) REPLACEMENT.

1. Secure bottom cover to the underside of the subassembly. Insert A.F. LEVEL LINE A potentiometer (R651) into the hole on the front panel assigned to it (see figure 3-1), and then place the subassembly in position upon the top of the lower deck. Secure the subassembly to the lower deck by twisting the Dzus fasteners into corresponding fittings in the lower deck chassis. Se-

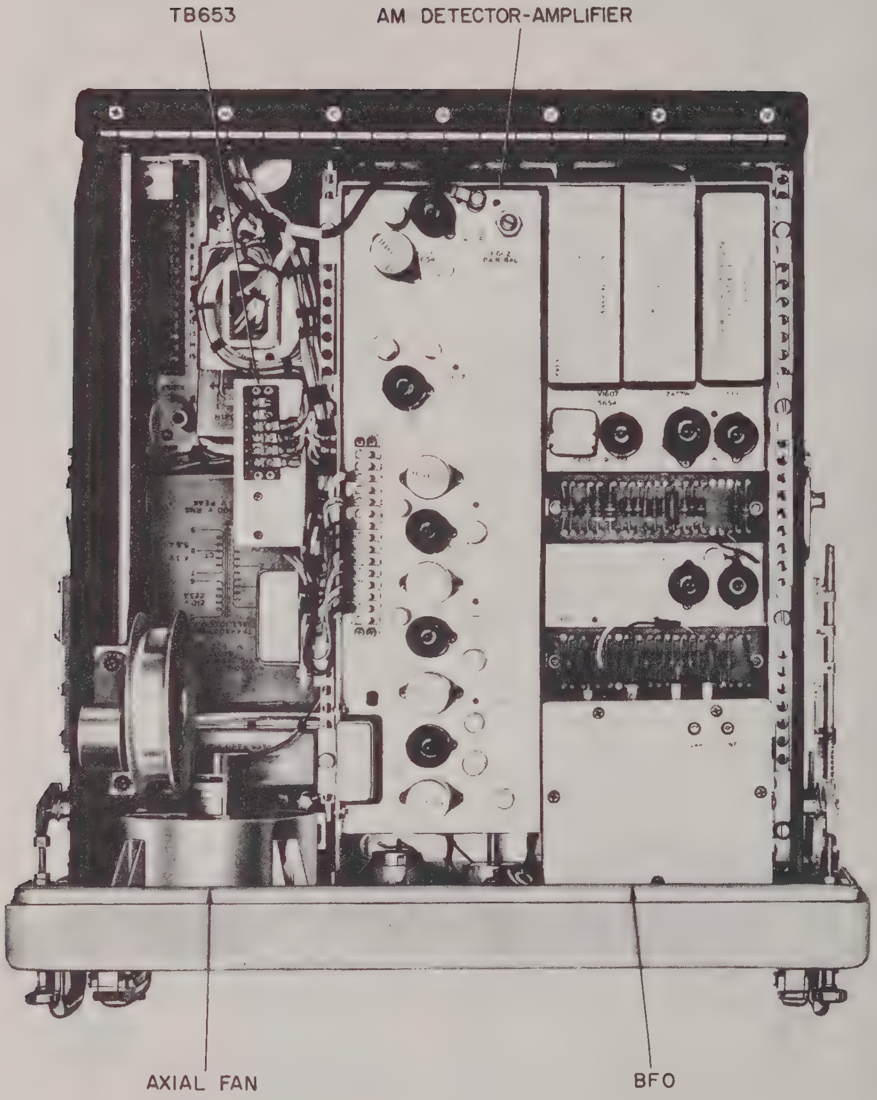


Figure 6-10. Demodulator Drawer, Upper Deck, Top View

cure the potentiometer, and re-install its knob.

2. Connect P1001 of cable W653 to J1001, P1002 of cable W655 to J1002, and P1003 of cable W656 to J1003.

3. Lower the upper deck to the horizontal position and tilt the whole drawer 90 degrees.

4. Solder coded leads to feed-through capacitors C1001, C1002, C1015, and C1024 at the rear apron of the subassembly, and also solder previously disconnected lead to feed-through capacitor C1033 on the subassembly's front apron.

5. Connect related coded leads to terminal board TB1001.

6. Close and lock demodulator drawer.

(4) LSB DETECTOR-AMPLIFIER. (See figures 6-8 and 6-9.)

(a) REMOVAL.

1. Pull out demodulator drawer and tilt it 90 degrees.

2. Remove connections from terminal board TB1001, located on the bottom lip of the forward apron of the subassembly (figure 5-72).

3. Unsolder leads from feed-through capacitors C1101, C1102, C1125, and C1138, located on the rear apron of the subassembly, and also unsolder the lead from feed-through capacitor C1134, located on the front apron of the subassembly. Note coding of leads for reinstallation.

4. Lower the entire drawer to the horizontal position and lock in place. Tilt upper deck to 85 degrees.

5. Remove P1101 of cable W656 from J1101, P1102 of cable W652 from J1102, and P1103 of cable W655 from J1103.

6. Remove knob from shaft of front panel A.F. LEVEL LINE B control (R652), and remove the control itself from the demodulator front panel (see figure 3-1).

7. Twist Dzus fasteners to release the subassembly, and remove it from the demodulator.

(b) ADJUSTMENT AND REPAIR.—The LSB detector-amplifier needs no mechanical adjustments. Its components are readily accessible from above and below (on removal of the bottom plate), except for bandpass filter FL1101, and LSB demodulator Z1101. The latter units are reached for removal and replacement by loosening and moving terminal boards TB1102, TB-1103, and TB1104 aside. If necessary, unsolder leads to permit movement. After replacement of either unit, resolder leads to the terminal boards and secure them in position.

(c) REPLACEMENT.

1. Secure bottom cover to the underside of the subassembly. Insert A.F. LEVEL LINE B potentiometer (R652) into its hole in the front panel, and then position the subassembly upon the top of the lower deck. Secure it by twisting its Dzus fasteners into corresponding fittings in the lower deck chassis. Secure the potentiometer, and re-install its knob.

2. Connect P1101 of cable W656 to J1101, P1102 of cable W652 to J1102, and P1103 of cable W655 to J1103.

3. Lower the upper deck to the horizontal position, and tilt the drawer 90 degrees.

4. Solder coded leads to feed-through capacitors C1101, C1102, C1125 and C1138 on the rear apron of the subassembly, and solder back the lead originally removed from feed-through capacitor C1134 on the front apron of the subassembly.

5. Connect coded power leads to terminal board TB1101.

6. Close and lock demodulator drawer.

(5) DEMODULATOR POWER SUPPLY. (See figures 6-8 and 6-9.)

(a) REMOVAL OF DEMODULATOR POWER SUPPLY SUBASSEMBLY.

1. Pull out and lock demodulator drawer. Tilt upper deck 85 degrees.

2. Remove connecting lugs of cable W658 from terminal board TB1201, accessible from the top of the power supply chassis (figure 5-6).

3. Unlock the power supply's six Dzus fasteners, and remove it from the top section of the demodulator lower deck. (Temporarily relocate cabling as necessary in way of this removal.)

(b) REMOVAL OF COMPONENTS.—Certain components of the demodulator power supply, due to compactness of parts layout, must first be raised from their seating prior to unsoldering leads from their terminals. Power transformer T1201 and filter choke L1201 must be treated in this manner, whereas other components of the subassembly are readily accessible and can be removed by routine procedures.

1. To remove power transformer T1201, turn subassembly bottom up, and remove four screws at the bottom of the power transformer. Hold the transformer in place to prevent it from falling out.

2. Turn the subassembly right side up, and raise the transformer from its seating sufficiently to expose its terminals. (Greater access is possible by also moving the filter choke.) (See step *4* below.)

3. Unsolder leads from the transformer terminal block and remove it from the subassembly. Note coding of the leads for reinstallation.

4. To remove filter choke L1201 with the power transformer in place, turn the power supply subassembly bottom up, and remove the four screws which secure the filter choke. Hold the choke to prevent its falling out.

5. Turn the subassembly right side up and list the filter choke sufficiently to expose its terminals.

6. Unsolder leads from the filter choke terminals. Note coding of leads for reinstallation. Remove the choke from the subassembly.

7. To remove any one of semiconductor diodes CR1201, CR1202, CR1203, and CR1204, turn the subassembly bottom up. The open area of the subassembly's bottom plate permits ready access to the diodes.

Note

Take proper precautions, when removing any of the diodes from terminal board TB1202, to avoid overheating the diode in the unsoldering process. To protect the diode during unsoldering, clamp the lead between the semiconductor and soldering iron with long-nosed pliers.

8. To remove either of the socket-mounted filter capacitors, remove the cap from the top of the capacitor can, and remove the capacitor from its socket.

(c) ADJUSTMENT AND REPAIR.—The demodulator power supply subassembly is conventional in construction and requires no mechanical adjustments.

(d) REPLACEMENT OF SUBASSEMBLY.

1. Position the subassembly from the top of the lower deck of the demodulator unit (with the upper deck already tilted to 85 degrees) and secure by means of six Dzus fasteners.

2. Connect coded leads of cable W658 to terminal board TB1201 at the top left area of the power supply subassembly.

(e) REPLACEMENT OF COMPONENTS.

1. Place power transformer T1201 in vicinity of its permanent seating in the power supply subassembly (assuming filter choke L1201 to be installed in place) so that connecting leads reach the appropriate transformer terminals. (Move L1201 as necessary to gain access to transformer terminals for soldering leads.)

2. Solder coded leads to associated terminals of the transformer terminal block.

3. Set the transformer in place on the power supply chassis, and secure to the subassembly by tightening screws through the clearance holes on the underside of the subassembly to the threaded holes of the bottom of T1201. Replace L1201 if it has been moved.

4. Perform steps similar to step *1* through step *3* on replacing filter choke L1201 (assuming power transformer T1201 installed in place), with due regard for proper seating of the choke for correct connections of coded leads to the corresponding terminals.

5. Replace filter capacitors by inserting them into the respective plug-in sockets and securing the top caps.

6. Replace semiconductor diodes CR1201, CR-1202, CR1203, and CR1204 by soldering them to appropriate terminals on the terminal board TB1202. Protect the diodes while soldering by using the technique in NOTE of step 7 of 6-5*c*(5)*(b)*.

(6) DEMODULATOR BLISTER. (See figure 6-6.)

(a) GENERAL.—The demodulator blister consists of a group of cable connectors mounted on a beveled framework bolted to an auxiliary panel (figure 5-78). This panel is in turn secured to the housing by nine fisteners which fit grooves of the mounting posts to which they secure. The panel contains two audio frequency filters, and an ac line filter, in addition to two ac line fuses and a third one serving as a spare. The blister connections are joined to the demodulator subassemblies by a length of cable, whose terminals at the blister end are soldered to the cable connectors and filter units in the blister, and whose terminals at the demodulator end are contained in a plug (P1801) which mates with a jack (J651) of the demodulator. The cable wraps around a pulley in a double pulley and spring arrangement such that when the demodulator drawer is pulled out from the cabinet housing, the cable pulley rotates to release the cable, while at the same time, the spring pulley causes the cable arrangement (pulley and cable) to move towards the back of the drawer on the shafting to which the pulley is connected.

(b) REMOVAL OF DEMODULATOR BLISTER PANEL.

1. Pull out the demodulator drawer and tilt the upper deck 85 degrees.

2. Remove P1801 of the blister cable from J651 and remove the cable from the pulley, after first removing cable clamp from rear apron bracket.

3. Remove the demodulator drawer from the receiver as outlined in Section 2.

4. Loosen the panel from its securing posts by releasing the fasteners.

5. Tilt the panel to make cable connectors at the back of the blister subassembly accessible.

6. Separate the following cable connectors: (1) connectors P1802 and P1803 from J1802 and J1803 respectively; (2) P1804 from J1804; (3) P1805 from J1805; (4) P1806 from J1806; (5) P1807 from J1807; and (6) connector P1808 from J1808.

7. Remove the panel from the cabinet.

(c) ADJUSTMENT AND REPAIR.—The blister panel requires no mechanical adjustments. Components on the panel are readily removed and replaced as the need arises.

(d) REPLACEMENT OF PANEL.

1. Place the blister panel in the cabinet so that the panel fasteners fit against corresponding mounting posts.

2. With the panel tilted to permit installing connectors to jacks at the beveled portion of the blister, connect the following: (1) connectors P1802 and P1803 to jacks J1802 and J1803 respectively; (2) P1804 to J1804; (3) P1805 to J1805; (4) P1806 to J1806; (5) P1807 to J1807; and (6) connector P1808 to J1808.

3. Raise panel to fit fasteners to mounting posts, and secure in place.

4. Reinstall demodulator drawer in receiver.

5. Wrap the cable around the pulley and connect cable plug P1801 to jack J651. Also reconnect cable clamp. (The upper deck is to be at the 85 degree tilt.)

6. Close and lock the demodulator drawer.

d. MAINTENANCE OF AUXILIARY PARTS.

(1) GENERAL.—This section includes supplementary information on removal and replacement of the receiver's INTERNAL STANDARD ADJUSTMENT control, INT. STD. LOG counter (figure 5-55) air filter, located on the front cover on top of the converter unit, and ventilating axial fan (figure 6-10). Information is also provided on lubrication of certain items.

(2) INTERNAL STANDARD ADJUSTMENT CONTROL AND INT. STD. LOG COUNTER.

(a) REMOVAL.

1. Pull out converter drawer and lock it in place.

2. Turn Dzus fasteners of the crystal oscillator subassembly to permit elevating the subassembly from its permanent seating. Lift the crystal oscillator subassembly so that the INT STD LOG counter assembly on the front apron of the crystal oscillator subassembly clears the post of the converter front panel under the front cover.

3. Remove the case enclosing the crystal trimmer capacitor (C719).

4. Unsolder leads to the trimmer capacitor.

5. Remove the subassembly of crystal trimmer capacitor and INT. STD. LOG counter by removing four screws from the counter enclosure casting.

(*b*) ADJUSTMENT AND REPAIR.—The crystal trimmer capacitor and counter subassembly comprise one complete unit. Therefore, if either the counter or the capacitor becomes defective and requires replacement, the entire subassembly must be removed from the crystal oscillator front apron and a new unit installed in its place.

(*c*) REPLACEMENT.

1. Place the subassembly of trimmer capacitor and INT. STD. LOG counter on the front apron of the crystal oscillator as in figure 5-55, and secure the casting of the subassembly to the front apron.

2. Solder associated leads to the trimmer capacitor.

3. Mount case over the trimmer capacitor by securing the case to the front apron, right next to the casting enclosure of the counter.

4. Return crystal oscillator subassembly to its permanent seating and secure it in place.

5. Close and lock converter drawer.

(3) VENTILATING AXIAL FAN.

(*a*) REMOVAL.

1. Pull out and lock demodulator drawer.

2. Remove the front screen from the left section of the upper deck front panel. This exposes the four screws joining the brackets of the motor mounting to the front panel.

3. Remove the three lead wires of the motor from their connections. Note coding of the leads for reinstallation.

4. Remove screws from brackets of the motor mounting and remove the axial fan from the upper deck. Note the position of the mounting with respect to the directional arrow between adjacent mounting brackets.

(*b*) ADJUSTMENT AND REPAIR.—There are no mechanical adjustments to make on this subassembly. The motor is completely sealed, and the propeller comes as part of the unit. Therefore, when any part of the unit requires replacement, replace the whole unit. The capacitor associated with the 115 volt, 60 cycle motor input is also to be replaced if it becomes defective, and the same applies to the thermostatic control, located on the upper deck just behind the capacitor (figure 6-11).

(*c*) REPLACEMENT.

1. Insert the axial fan at the back of the upper deck panel in the opening provided for it. Position the mounting so that the directional arrow on the motor mounting corresponds in location with that of the original installation. Secure the axial fan to the front panel.

2. Replace the screen over the opening on the front panel to cover the propeller.

3. Reconnect coded motor leads to appropriate connections.

4. Close and lock demodulator drawer.

(4) AIR FILTER.

(*a*) REMOVAL AND REPLACEMENT.—The air filter, located in the receptacle on the cover on the front panel of the converter unit (figure 3-1) is readily removed by removing six screws from the cover. For replacement, the reverse procedure is followed.

(*b*) ADJUSTMENT AND REPAIR.—The air filter does not lend itself readily to repairs as such, but the quality of its operation prior to need for replacement does depend appreciably upon the degree of care given it during its period of service. The following instructions are to be adhered to at least once each three months, or at more frequent intervals if the need becomes apparent.

1. Remove the filter from the receptacle in the panel cover.

2. Tap the filter gently to rid it of loose dirt.

3. Brush the outer surface with a soft brush.

4. Wash the filter in hot water solution of dishwashing compound, and allow it to dry thoroughly.

5. Recharge the filter by dipping in approved "viscous impingement" oil.

6. Drain off excess oil, and replace the filter in the panel receptacle.

e. LUBRICATION.

(1) GENERAL.—The operations described below are to be performed semiannually.

(2) LUBRICATION OF COMPONENTS.

(*a*) COUNTERS, H.F. ADJ. LINKAGE, AND TUNING MECHANISM.

1. Pull out and lock converter drawer. Tilt the upper deck to 70 degrees.

2. Lubricate sleeve bearings of MEGACYCLE counter mechanism as shown in figure 6-12, including main shaft bearings and those of all four counter shafts, only one of which is shown in the figure. Lubricate shaft bearings of INT. STD. LOG counter, and H.F. ADJ. linkage. Grease worms and pinions associated with tuning mechanism.

(*b*) LUBRICATION OF BAND SELECTOR SWITCH. (See figure 6-13).

1. Lower the upper deck to its horizontal position, and tilt the entire unit 90 degrees to expose the bottom of the lower deck of the converter drawer.

2. Lubricate the detent subassembly associated with BAND selector switch. Rotate the switch through all positions to distribute the grease. Lubricate shaft sleeve bearings and arms of the band changing mechanism.

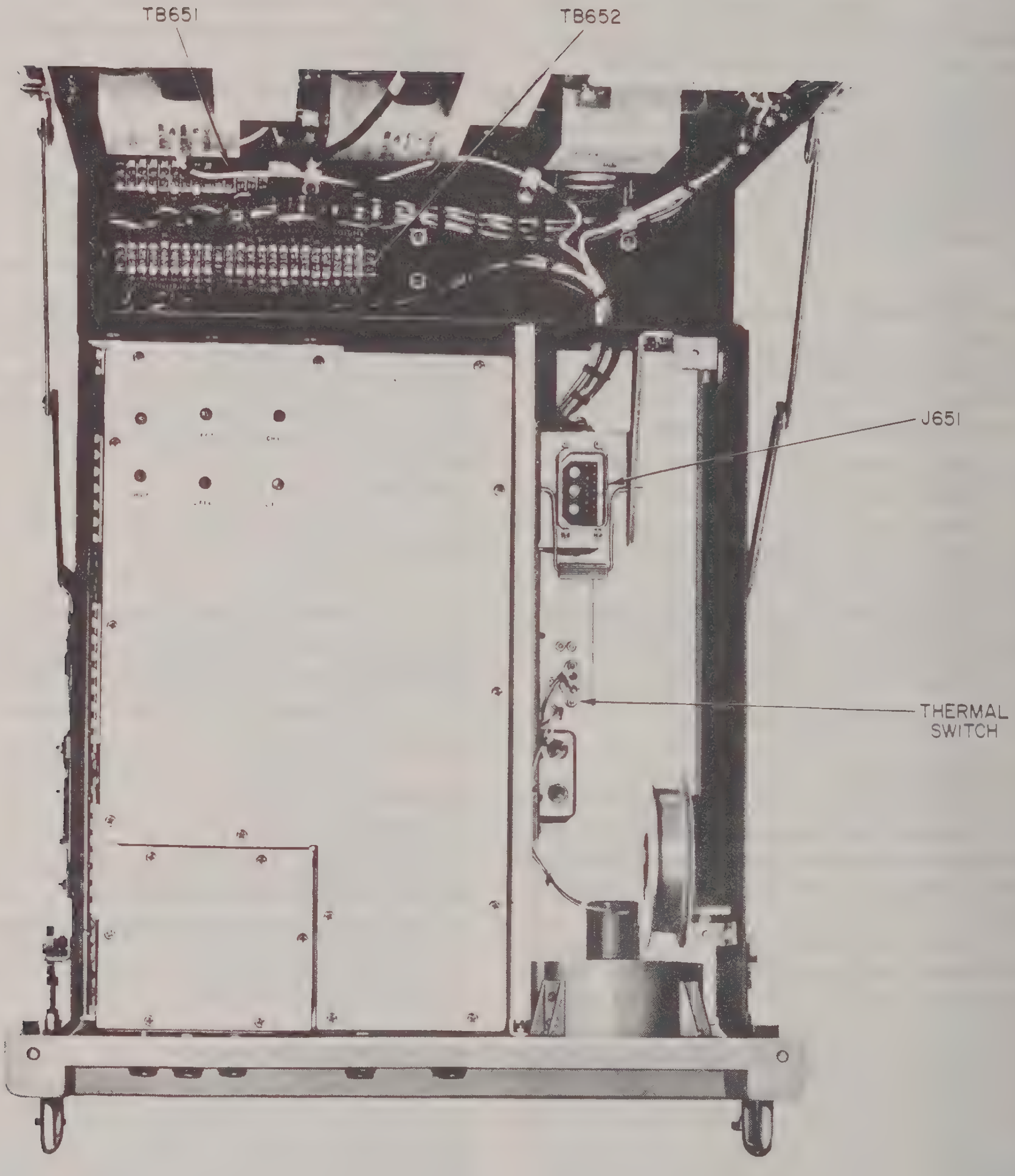
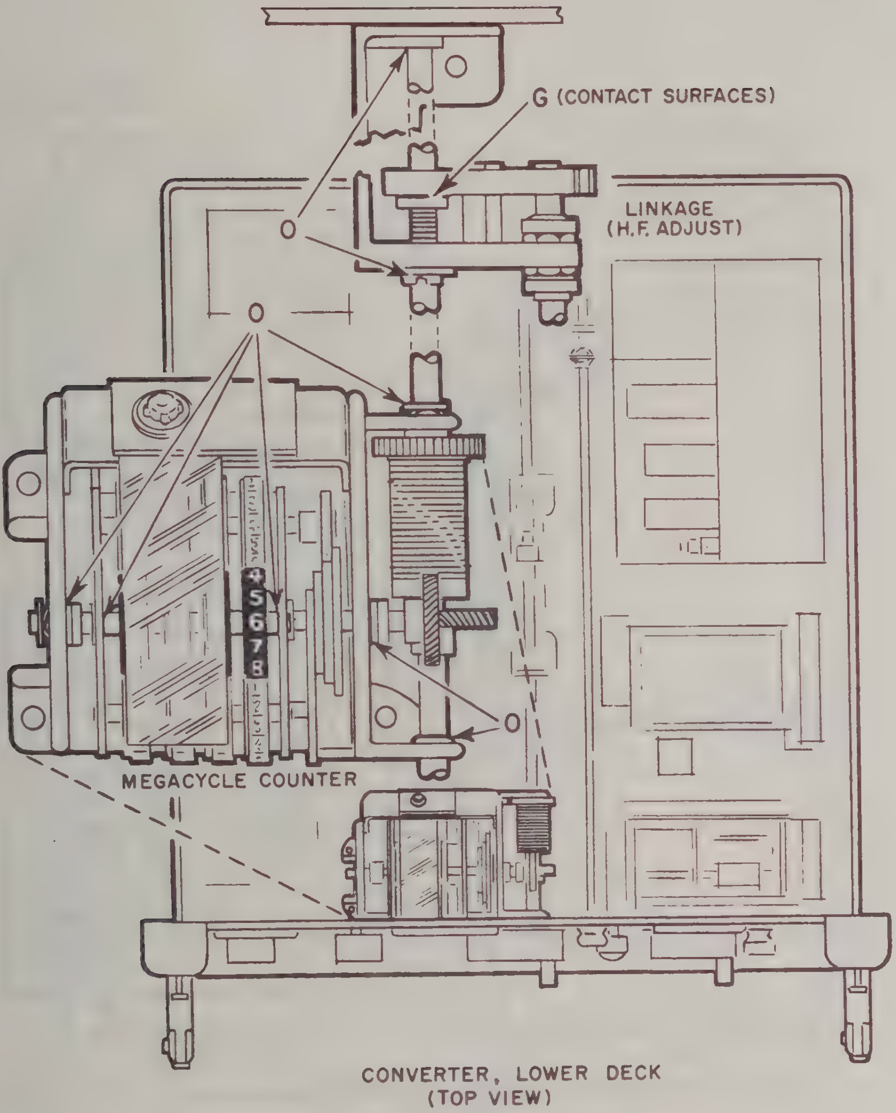


Figure 6-11. Demodulator Drawer, Upper Deck, Bottom View

(*c*) LUBRICATION OF DRAWER SLIDES.—With converter drawer tilted to the 90-degree position, lubricate points shown on slide and tilt mechanisms (left and right sides) including drawer handle pivot points, bracket and index pivots, tumblers, chassis tracks and corresponding rails inside the cabinet, all as shown in figure 6-14. Lower the drawer to its horizontal position, push into its cabinet housing, and lock in place. Perform the operations just outlined for lubricating corresponding items on the sides of the demodulator unit.

f. DIAL LAMPS.—The receiver is equipped with four lamps, of which two are front panel mounted on the converter unit (figure 3-1), and the other two are mounted respectively on transparent plastic and brackets on the top of the MEGACYCLE and KILOCYCLE counters inside the converter unit. The front panel lamps are readily accessible from the front, while the other two can also be readily reached when the converter drawer has been pulled out and the upper deck tilted to its 70-degree position. In every case, removal



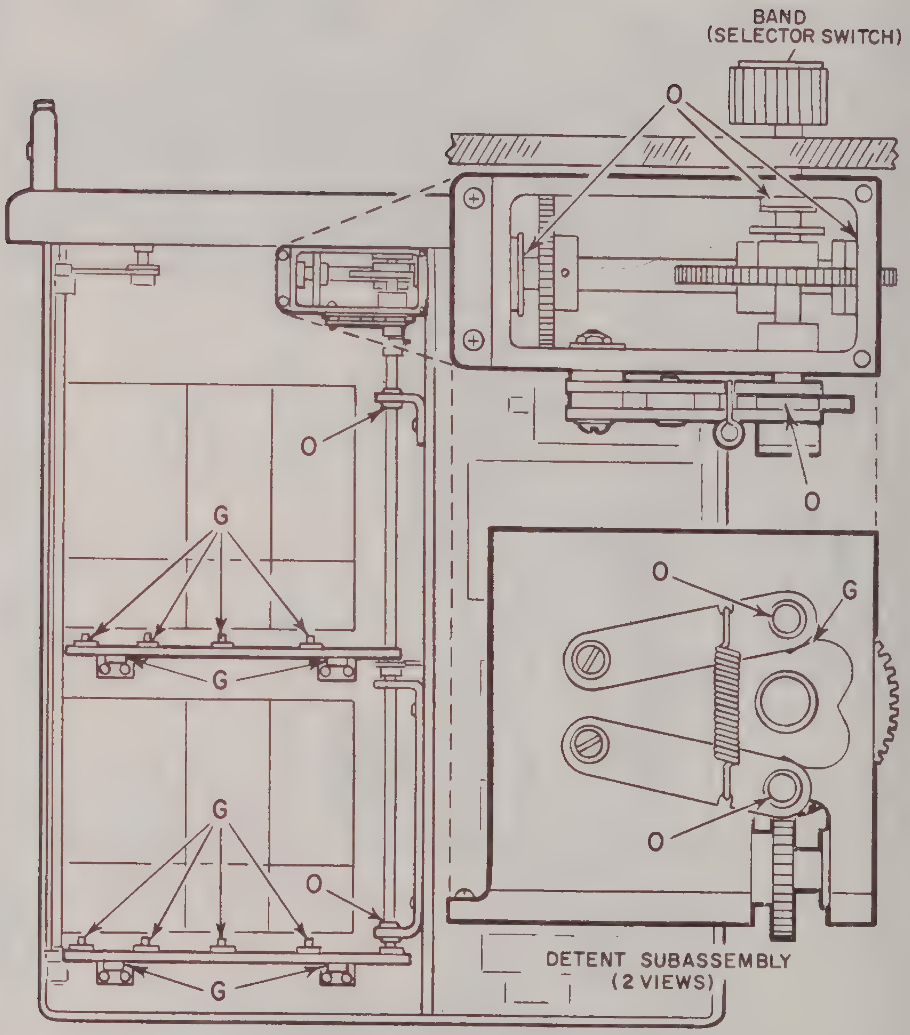
O–OIL: MIL–L–6085 (1–2 DROPS)
G–GREASE: MIL–G–16908 (VERY LIGHT COAT)

Figure 6-12. Lubrication Points, Counter Mechanism

of the lamp involves unscrewing the composition-type top of the lamp holder out from its socket and removing it. Replacement requires the reverse procedure. The lamp itself is snapped out from the lamp holder, and conversely, its replacement can be snapped back.

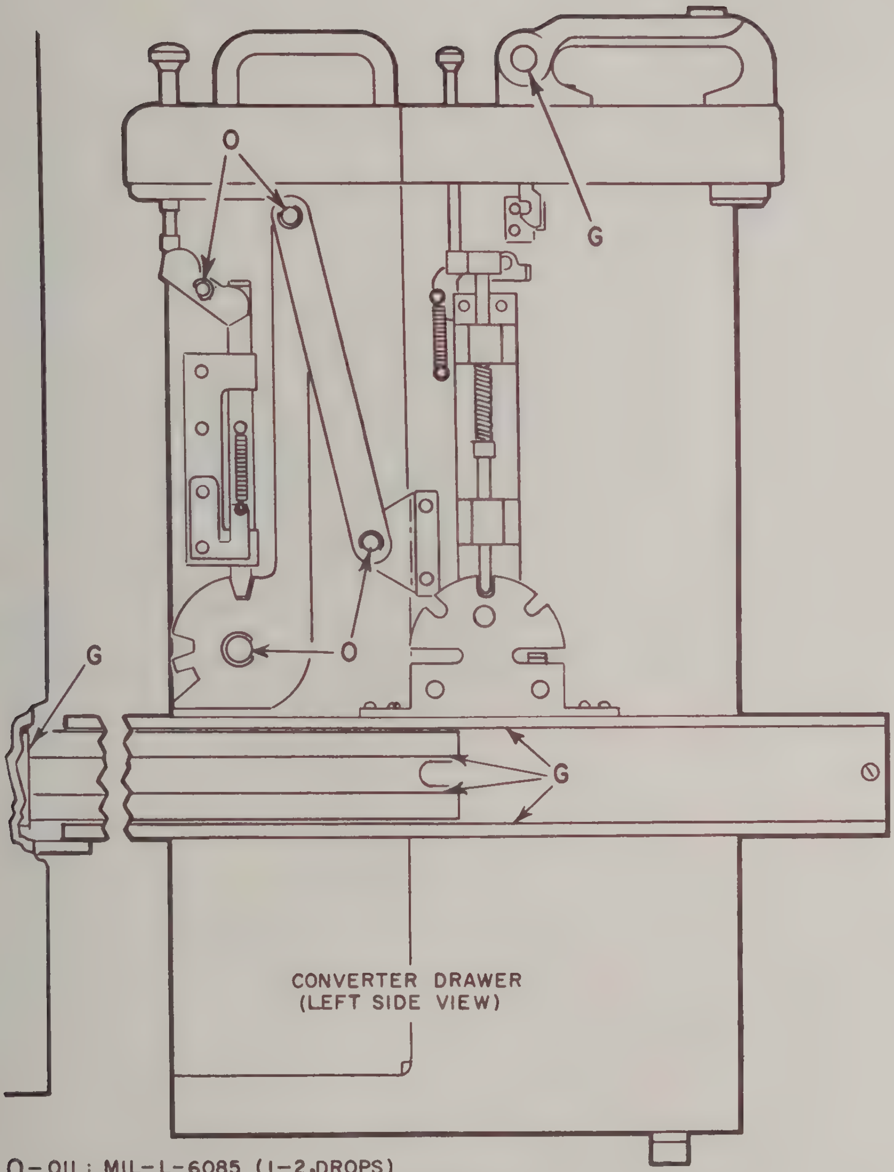
6-6. SCHEMATIC DIAGRAMS.

This section contains complete schematic diagrams of all of the receiver's functional subassemblies. The diagrams are arranged in sequence to conform with the physical arrangement of the assemblies in the respective decks of converter and demodulator drawers. Specifically, figures 6-15 to 6-17 indicate circuits of functional subassemblies located in the converter drawer, while circuit diagrams of figures 6-18 to 6-20 relate to subassemblies of the demodulator drawer. This sequence of diagrams also meets the desired condition of progressing in the same sense with the actual signal path of the receiver. The last three diagrams (figures 6-21 to 6-23) contain information on interconnecting cables in the receiver proper, and external cables connecting blisters of the respective drawers.


BAND
(SELECTOR SWITCH)
O
O
O
O
G
G
G
G
O
G
O
O
G
DETENT SUBASSEMBLY
(2 VIEWS)
CONVERTER, LOWER DECK
(BOTTOM VIEW)

O–OIL: MIL-L-6085 (1–2 DROPS)
G–GREASE: MIL-G-16908 (VERY LIGHT COAT)

Figure 6–13. Lubrication Points, Bandswitching Mechanism


O
G
G
O
G
CONVERTER DRAWER
(LEFT SIDE VIEW)

O – OIL: MIL-L-6085 (1-2 DROPS)
G – GREASE: MIL-G-16908 (VERY LIGHT COAT)

Figure 6–14. Lubrication Points, Slide Mechanism

TABLE 6-5. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-15

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V51	V	.48	1	3.1ac	3.1ac	100	95	1		
5654	R	2.8m	155	0	0	17k	17k	155		
V101	V	.5	1.55	3.1ac	3.1ac	75	95	1.55		
5654	R	3m	230	0	0	inf	17k	230		
V151	V	0	1.5	3.1ac	3.1ac	120	80	0		
5750	R	0	200	0	0	inf	24k	100k		
V201	V	—3	.9	3.1ac	3.1ac	120	120	.9		
5654	R	250 20k*	100			25k	25k	100		
V202	V	0	3.3	3.1ac	3.1ac	132	132	3.3		
5654	R	675k	570			24k	24k	570		
V251	V	0	1.4	3.1ac	3.1ac	117	62	—.15		
5750	R	0	220			45k	50k	100k		
V301	V	6.4ac	0	—7.9	95	0	95	—7.9	0	0
5670	R	2.2	0	15k	20k	0	20k	15k	0	0

k = kilohm

m = megohm

*Measure resistance to ground using both polarities of ohmmeter.

inf = infinity

NOTE

1. All resistance measurements made with the power off and interconnecting coaxial cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.

TABLE 6-5. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-15

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V51	V	.48	1	3.1ac	3.1ac	100	95	1		
5654	R	2.8m	155	0	0	17k	17k	155		
V101	V	.5	1.55	3.1ac	3.1ac	75	95	1.55		
5654	R	3m	230	0	0	inf	17k	230		
V151	V	0	1.5	3.1ac	3.1ac	120	80	0		
5750	R	0	200	0	0	inf	24k	100k		
V201	V	—3	.9	3.1ac	3.1ac	120	120	.9		
5654	R	250 20k*	100			25k	25k	100		
V202	V	0	3.3	3.1ac	3.1ac	132	132	3.3		
5654	R	675k	570			24k	24k	570		
V251	V	0	1.4	3.1ac	3.1ac	117	62	—.15		
5750	R	0	220			45k	50k	100k		
V301	V	6.4ac	0	—7.9	95	0	95	—7.9	0	0
5670	R	2.2	0	15k	20k	0	20k	15k	0	0

k = kilohm

m = megohm

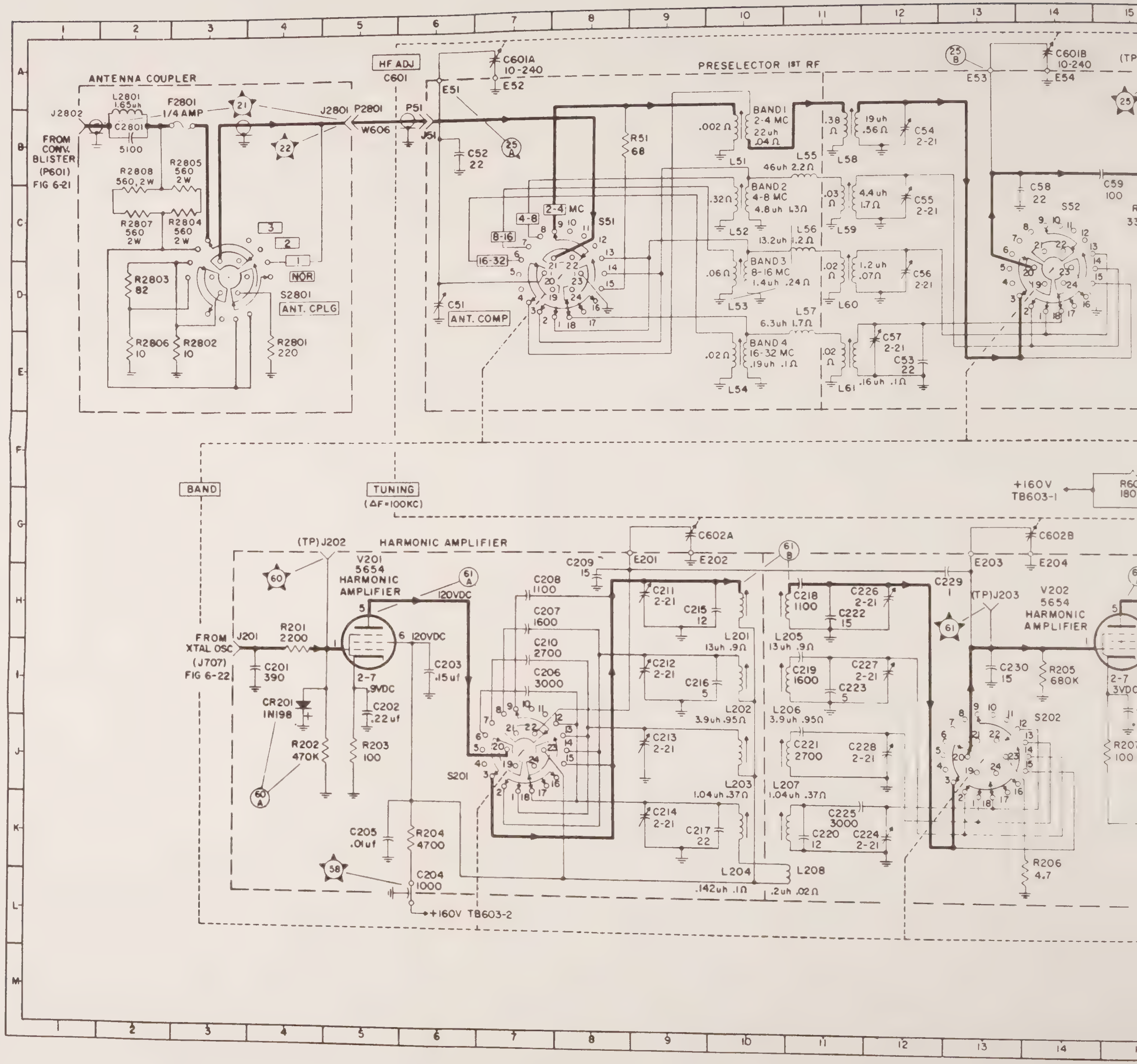
inf = infinity

*Measure resistance to ground using both polarities of ohmmeter.

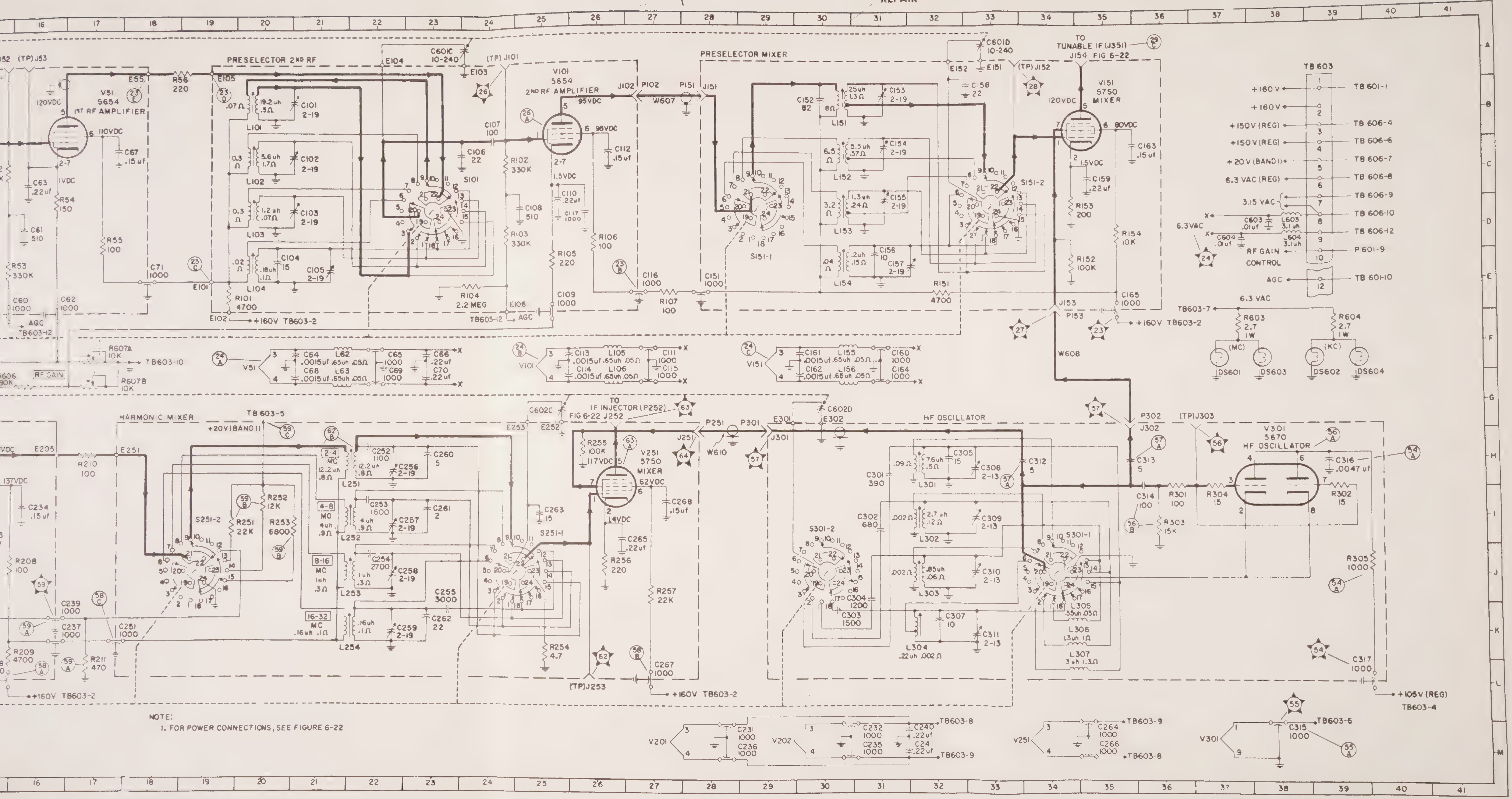
NOTE

1. All resistance measurements made with the power off and interconnecting coaxial cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.

C51	D6
C52	B6
C53	E12
C54	B12
C55	C12
C56	D12
C57	E12
C58	C14
C59	C15
C60	F15
C61	D16
C62	E16
C63	C16
C64	F20
C65	F22
C66	F23
C67	C17
C68	F20
C69	F22
C70	F23
C71	E18
C101	B21
C102	C21
C103	D21
C104	E20
C105	E21
C106	C24
C107	B24
C108	D25
C109	E25
C110	D25
C111	F27
C112	C26
C113	F25
C114	G25
C115	G27
C116	E27
C151	E28
C152	B30
C153	B31
C154	C31
C155	D31
C156	E31
C157	E32
C158	B33
C159	C35
C160	F31
C161	F30
C162	F30
C163	C36
C164	F31
C165	E35
C201	I4
C202	J5
C203	I6
C204	L6
C205	K5
C206	J7
C207	I7
C208	H7
C209	H8
C210	I7
C211	H9
C212	I9
C213	J9
C214	K9
C215	H10
C216	I10
C217	K10
C218	H11
C219	I11
C220	K11
C221	J11
C222	H11
C223	I11
C224	K12
C225	K12
C226	H12
C227	I12
C228	J12
C229	H13
C230	J13
C231	M28
C232	M31
C233	I15
C234	I16
C235	M31
C236	M28
C237	K16
C238	L15
C239	K16
C240	M32
C241	M32
C251	K17
C252	H22
C253	I22
C254	J22
C255	J23
C256	H22
C257	I22
C258	J22
C259	K22
C260	H23
C261	I23
C262	K23
C263	I25
C264	M35
C265	I27
C266	M35
C267	L27
C268	I27
C301	H31
C302	I31
C303	K30
C304	J31
C305	H32
C307	K32
C308	H33
C309	I33
C310	J33
C311	K33
C312	H34
C313	H36
C314	I36
C315	M38
C316	H39
C317	L40
C601A	A7
C601B	A14
C601C	A24
C601D	A33
C602A	G9
C602B	G14
C602C	G25
C602D	G30
C603	D38
C604	D37
CR201	J4
DS601	F37
DS602	F39
DS603	F38
DS604	F39
F2801	B3
J51	B6
J102	B27
J151	B28
J153	E34
J154	A35
J201	H3
J251	H28
J252	G26
J301	H29
J302	H35
J2801	B5
J2802	B1
L51	B10
L52	C10
L53	D10
L54	E10
L55	C11
L56	D11
L57	E11
L58	B11
L59	C11
L60	D11
L61	E11
L62	F21
L63	G21
L101	B20
L102	C20
L103	D20
L104	E20
L105	F26
L106	G26
L151	B30
L152	C30
L153	D30
L154	E30
L155	F31
L156	F31
L201	H10
L202	I10
L203	J10
L204	K10
L205	H11
L206	I11
L207	J11
L208	K11
L251	H21
L252	I21
L253	J21
L254	K21
L301	H32
L302	I32
L303	J32
L304	K32
L305	K35
L306	K35
L307	L35
L603	D38
L604	D38
P51	B6
P102	B27
P151	B28
P153	F34
P252	H28
P301	H29
P302	G36
P2801	B5
R51	B9
R52	C15
R43	E15
R54	D16
R55	D17
R56	A19
R101	E19
R102	C24
R103	D24
R104	E24
R105	E25
R106	D26
R107	E27
R151	E32
R152	E35
R153	C35
R154	C35
R201	I4
R202	J5
R203	J5
R204	K6
R205	I14
R206	K14
R207	J15
R208	J16
R209	L16
R210	H17
R211	L17
R251	I19
R252	I20
R253	I20
R254	K25
R255	H26
R256	J26
R257	J27
R258	H27
R301	I36
R302	I39
R303	I36
R304	I37
R305	J39
R603	F38
R604	F39
R605	E15
R606	G16
R607A	F17
R607B	G17
R2801	E4
R2802	E3
R2803	D2
R2804	C2
R2805	C3
R2806	E2
R2807	B2
R2808	B3
S51	D8
S52	D14
S101	D23
S151-1	D29
S151-2	D33
S201	J7
S202	J13
S251-1	J25
S251-2	J19
S301-1	J34
S301-2	J30
S2801	D3
J52 (TP)	B15
J53 (TP)	B16
J101 (TP)	B24
J152 (TP)	A34
J202 (TP)	H5
J203 (TP)	H13
J253 (TP)	L26
J303	H36
V51	B17
V101	B25
V151	B35
V201	H5
V202	H15
V251	H27
V301	H38



ANTENNA COUPLER
PRESELECTOR 1ST RF
HF ADJ
C601
C601A 10-240
C601B 10-240
J2802
FROM CONV. BLISTER (P601) FIG 6-21
L2801 1.65uh
C2801 5100
F2801 1/4 AMP
J2801
P2801
W606
P51
J51
E51
E52
E53
E54
C52 22
R51 68
R2808 560, 2W
R2805 560 2W
R2807 560 2W
R2804 560 2W
R2803 82
R2806 10
R2802 10
R2801 220
S2801
ANT. CPLG
NOR
C51
ANT. COMP
S51
BAND 1 2-4 MC 22uh .04Ω
BAND 2 4-8 MC 4.8uh
BAND 3 8-16 MC 1.4uh
BAND 4 16-32 MC .19uh
L51
L52
L53
L54
L55
L56
L57
L58
L59
L60
L61
C54 2-21
C55 2-21
C56 2-21
C57 2-21
C53 22
C58 22
C59 100
S52
BAND
TUNING (ΔF=100KC)
+160V TB603-1
HARMONIC AMPLIFIER
(TP) J202
V201 5654 HARMONIC AMPLIFIER
120VDC
FROM XTAL OSC (J707) FIG 6-22
J201
R201 2200
C201 390
CR201 1N198
R202 470K
R203 100
C202 .22uf
C203 .15uf
C204 1000
C205 .01uf
R204 4700
+160V TB603-2
S201
C602A
C602B
E201
E202
E203
E204
C206 3000
C207 1600
C208 1100
C209 15
C210 2700
C211 2-21
C212 2-21
C213 2-21
C214 2-21
C215 12
C216 5
C217 22
L201 13uh .9Ω
L202 3.9uh .95Ω
L203 1.04uh .37Ω
L204 .142uh .1Ω
C218 1100
C219 1600
C220 12
C221 2700
C222 15
C223 5
C224 2-21
C225 3000
C226 2-21
C227 2-21
C228 2-21
C229
C230 15
L205 13uh .9Ω
L206 3.9uh .95Ω
L207 1.04uh .37Ω
L208 .2uh .02Ω
(TP) J203
V202 5654 HARMONIC AMPLIFIER
R205 680K
R206 4.7
S202


PRESELECTOR 2ND RF
V51 5654 1ST RF AMPLIFIER
120VDC
110VDC
C67 .15 uf
C63 .22 uf
R54 150
C61 510
R53 330K
R55 100
C71 1000
C60 1000
C62 1000
AGC TB603-12
(TP) J53
E55
R56 220
E105
L101 19.2 uh .5Ω
C101 2-19
L102 5.6 uh 1.7Ω
C102 2-19
L103 1.2 uh .07Ω
C103 2-19
L104 .18 uh .1Ω
C104 15
C105 2-19
R101 4700
E101
E102 +160V TB603-2
E104
C601C 10-240
E103
(TP) J101
S101
C106 22
C107 100
R102 330K
C108 510
R103 330K
R104 2.2 MEG
E106
TB603-12 AGC
V101 5654 2ND RF AMPLIFIER
95VDC
C110 .22 uf
C117 1000
C112 .15 uf
R105 220
R106 100
C109 1000
C116 1000
R107 100
J102 P102 P151 J151
W607
PRESELECTOR MIXER
C601D 10-240
E152 E151
(TP) J152
C158 22
C152 82
L151 25 uh 1.3Ω
C153 2-19
L152 5.5 uh .57Ω
C154 2-19
L153 1.3 uh .24Ω
C155 2-19
L154 .2 uh .15Ω
C156 10
C157 2-19
S151-1
S151-2
R151 4700
C151 1000
TO TUNABLE IF (J351) J154 FIG 6-22
V151 5750 MIXER
120VDC
80VDC
C163 .15 uf
1.5VDC
C159 .22 uf
R153 200
R154 10K
R152 100K
C165 1000
J153 P153
+160V TB603-2
W608
TB 603
+160 V
+150 V (REG)
+20 V (BAND I)
6.3 VAC (REG)
3.15 VAC
6.3VAC
C603 .01 uf
L603 3.1 uh
C604 .01 uf
L604 3.1 uh
RF GAIN CONTROL
AGC
TB 601-1
TB 606-4
TB 606-6
TB 606-7
TB 606-8
TB 606-9
TB 606-10
TB 606-12
P 601-9
TB 601-10
TB603-7
R603 2.7 1W
R604 2.7 1W
(MC)
(KC)
DS601 DS603 DS602 DS604
R607A 10K
R607B 10K
TB603-10
RF GAIN
V51 C64 .0015 uf L62 .65 uh .05Ω C65 1000 C66 .22 uf C68 .0015 uf L63 .65 uh .05Ω C69 1000 C70 .22 uf
V101 C113 .0015 uf L105 .65 uh .05Ω C111 1000 C114 .0015 uf L106 .65 uh .05Ω C115 1000
V151 C161 .0015 uf L155 .65 uh .05Ω C160 1000 C162 .0015 uf L156 .65 uh .05Ω C164 1000
HARMONIC MIXER
TB 603-5
+20V (BAND I)
E205 E251
R210 100
137VDC
C234 .15 uf
R208 100
C239 1000
C237 1000
C251 1000
R209 4700
R211 470
+160V TB603-2
S251-2
R251 22K
R252 12K
R253 6800
2-4 MC L251 12.2 uh .8Ω
C252 1100
C256 2-19
C260 5
4-8 MC L252 4 uh .9Ω
C253 1600
C257 2-19
C261 2
8-16 MC L253 1 uh .3Ω
C254 2700
C258 2-19
C255 3000
16-32 MC L254 .16 uh .1Ω
C259 2-19
C262 22
S251-1
C263 15
E253 E252
C602C
TO IF INJECTOR (P252) FIG 6-22 J252
R255 100K
117VDC
V251 5750 MIXER
62VDC
C268 .15 uf
1.4VDC
C265 .22 uf
R256 220
R257 22K
R254 4.7
(TP) J253
C267 1000
+160V TB603-2
J251 P251 P301 J301
W610
E301 E302
C602D
HF OSCILLATOR
L301 7.6 uh .5Ω
C305 15
C308 2-13
C301 390
C312 5
L302 2.7 uh .12Ω
C309 2-13
C302 680
S301-2
L303 .85 uh .06Ω
C310 2-13
C304 1200
C303 1500
L304 .22 uh .002Ω
C307 10
C311 2-13
S301-1
L305 .35 uh .03Ω
L306 1.3 uh 1Ω
L307 3 uh 1.3Ω
P302 J302
(TP) J303
C313 5
C314 100
R301 100
R303 15K
V301 5670 HF OSCILLATOR
R304 15
C316 .0047 uf
R302 15
R305 1000
C317 1000
+105V (REG) TB603-4
V201 C231 1000 C236 1000
V202 C232 1000 C235 1000 C240 .22 uf C241 .22 uf TB603-8 TB603-9
V251 C264 1000 C266 1000 TB603-9 TB603-8
V301 C315 1000 TB603-6

NOTE:
1. FOR POWER CONNECTIONS, SEE FIGURE 6-22

Figure 6–15. Converter, Lower Deck (Antenna Coupler, Preselector Harmonic Amplifier, High Frequency Oscillator), Schematic Diagram

TABLE 6-6. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-16

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V401	V	−5.0	.5	3.1ac	3.1ac	84	84	5		
5654	R	270k	100			15k	15k	100		
V451	V	0	0	3.1ac	3.1ac	150	55	0		
5654	R	2.2k	0			16k	68k	0		
V452	V	0	9	3.1ac	3.1ac	120	120	9		
5654	R	1m	2.2k			90k	90k	2.2k		
V453	V	8	9	3.1ac	3.1ac	140	140	9		
5654	R	10k	2.2k			22k	22k	2.2k		
V501	V	0	1.5	3.1ac	3.1ac	120	120	1.5		
5654	R	inf	4700			22k	22k	4700		
V502	V	0	1.2	3.1ac	3.1ac	60	60	−.3		
5750	R	100	200			25k	25k	100k		
V503	V	0	1.5	3.1ac	3.1ac	160	75	0		
5750	R	100	200			inf	25k	100		
V504	V	−.8		3.1ac	3.1ac			470		
5654	R	*	4700			95k	95k			
V505	V	−6	.03	3.1ac	3.1ac	142	142	.03		
5654	R	2.3m	3k			30k	30k	3k		
V506	V	−.12	1	3.1ac	3.1ac	50	30	1		
5750	R	inf	200			30k	30k	68k		
V507	V	0	3	3.1ac	3.1ac	105	105	3		
5654	R	4	1k			25k	25k	1k		
V508	V	−5.5	0.1	3.1ac	3.1ac	115	152	0.1		
5654	R	1.6m	47			29k	29k	47		

k = kilohm

m = megohm

*See note on figure 6-16.

inf = infinity

NOTE

1. All resistance measurements made with the power off and interconnecting cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.
4. 100 kc TUNING Meter dipped at 2 mc (V501 thru V508 measurements only).

TABLE 6-6. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-16

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V401	V	−5.0	.5	3.1ac	3.1ac	84	84	.5		
5654	R	270k	100			15k	15k	100		
V451	V	0	0	3.1ac	3.1ac	150	55	0		
5654	R	2.2k	0			16k	68k	0		
V452	V	0	9	3.1ac	3.1ac	120	120	9		
5654	R	1m	2.2k			90k	90k	2.2k		
V453	V	8	9	3.1ac	3.1ac	140	140	9		
5654	R	10k	2.2k			22k	22k	2.2k		
V501	V	0	1.5	3.1ac	3.1ac	120	120	1.5		
5654	R	inf	4700			22k	22k	4700		
V502	V	0	1.2	3.1ac	3.1ac	60	60	−.3		
5750	R	100	200			25k	25k	100k		
V503	V	0	1.5	3.1ac	3.1ac	160	75	0		
5750	R	100	200			inf	25k	100		
V504	V	−.8		3.1ac	3.1ac			470		
5654	R	*	4700			95k	95k			
V505	V	−6	.03	3.1ac	3.1ac	142	142	.03		
5654	R	2.3m	3k			30k	30k	3k		
V506	V	−.12	1	3.1ac	3.1ac	50	30	1		
5750	R	inf	200			30k	30k	68k		
V507	V	0	3	3.1ac	3.1ac	105	105	3		
5654	R	4	1k			25k	25k	1k		
V508	V	−5.5	0.1	3.1ac	3.1ac	115	152	0.1		
5654	R	1.6m	47			29k	29k	47		

k = kilohm

*See note on figure 6-16.

m = megohm
inf = infinity

NOTE

1. All resistance measurements made with the power off and interconnecting cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.
4. 100 kc TUNING Meter dipped at 2 mc (V501 thru V508 measurements only).

C351A	B2
C351B	B4
C351C	B6
C351D	B7
C352	D3
C353	B4
C354	B5
C355	B5
C401	G8
C402	G9
C403	F8
C404	G7
C405	G7
C406	G8
C408	H5
C409	I5
C410	G4
C411	H3
C412	H10
C413	F3
C414	G3
C415	H11
C451	K32
C452	M34
C453	L35
C454	M35
C455	H38
C456	I37
C457	K36
C458	I37
C459	K39
C460	M38
C461	M39
C462	L40
C463	M40
C464	I31
C465	I31
C501	D9
C502	D11
C503	C22
C504	D22
C505	D21
C506	B25
C507	G27
C508	D27
C509	D27
C510	L3
C511	L5
C512	K6
C513	G14
C514	K8
C515	L9
C516	J8
C517	M10
C518	L11
C519	G15
C520	K13
C521	L14
C522	L13
C523	G17
C524	K16
C525	G21
C526	L18
C527	L18
C528	D28
C529	J22
C530	L25
C531	L23
C532	M24
C533	M26
C534	J25
C535	I26
C536	J24
C537	J26
C538	M29
C539	M28
CR501	G17
CR502	J23
FL502	B24
FL503	F25
FL504	K7
FL505	K15
J351	B2
~~J352~~	B8
J401	G2
J402	F2
J451	K31
J455	L42
J501	C9
J507	A27
J509	M12
J511	M23
L351	B2
L352	B3
L353	B4
L354	B6
L355	B7
L356	B7
L401	G5
L402	H6
L451	L36
L452	M40
L601	I11
L602	I11
M603	G34
M604	E34
P352	B8
R351	D3
R352	B8
R401	F11
R402	G10
R403	G9
R404	H5
R405	H2
R406	G2
R451	L32
R452	L34
R453	L35
R454	M35
R455	I38
R456	L37
R457	K37
R458	J38
R459	J38
R460	L38
R461	M39
R462	L39
R463	M41
R464	K32
R501	D10
R502	D11
R503	B19
R504	D21
R505	B23
R506	D23
R507	D26
R508	D26
R509	C28
R510	L2
R511	L4
R512	K6
R513	L7
R514	L6
R515	L9
R516	J9
R517	L10
R518	L10
R519	F15
R520	L12
R521	L13
R522	F16
R523	K14
R524	L14
R525	G16
R526	G22
R527	L17
R528	G18
R529	L19
R530	K22
R531	L24
R532	L26
R533	K25
R534	L24
R535	K26
R536	I23
R537	I23
R538	I24
R539	L5
R608	I5
T501	K3
T502	K11
T503	G20
(TP)	
J452	K32
(TP)	
J453	K37
(TP)	
J454	M41
(TP)	
J502	A10
(TP)	
J503	A20
(TP)	
J504	A20
(TP)	
J505	A25
(TP)	
J506	A26
(TP)	
J510	J17
V401	F10
V451	K33
V452	K38
V453	K40
V501	C10
V502	C21
V503	C27
V504	K5
V505	K10
V506	K13
V507	K17
V508	K24
Z501	B12

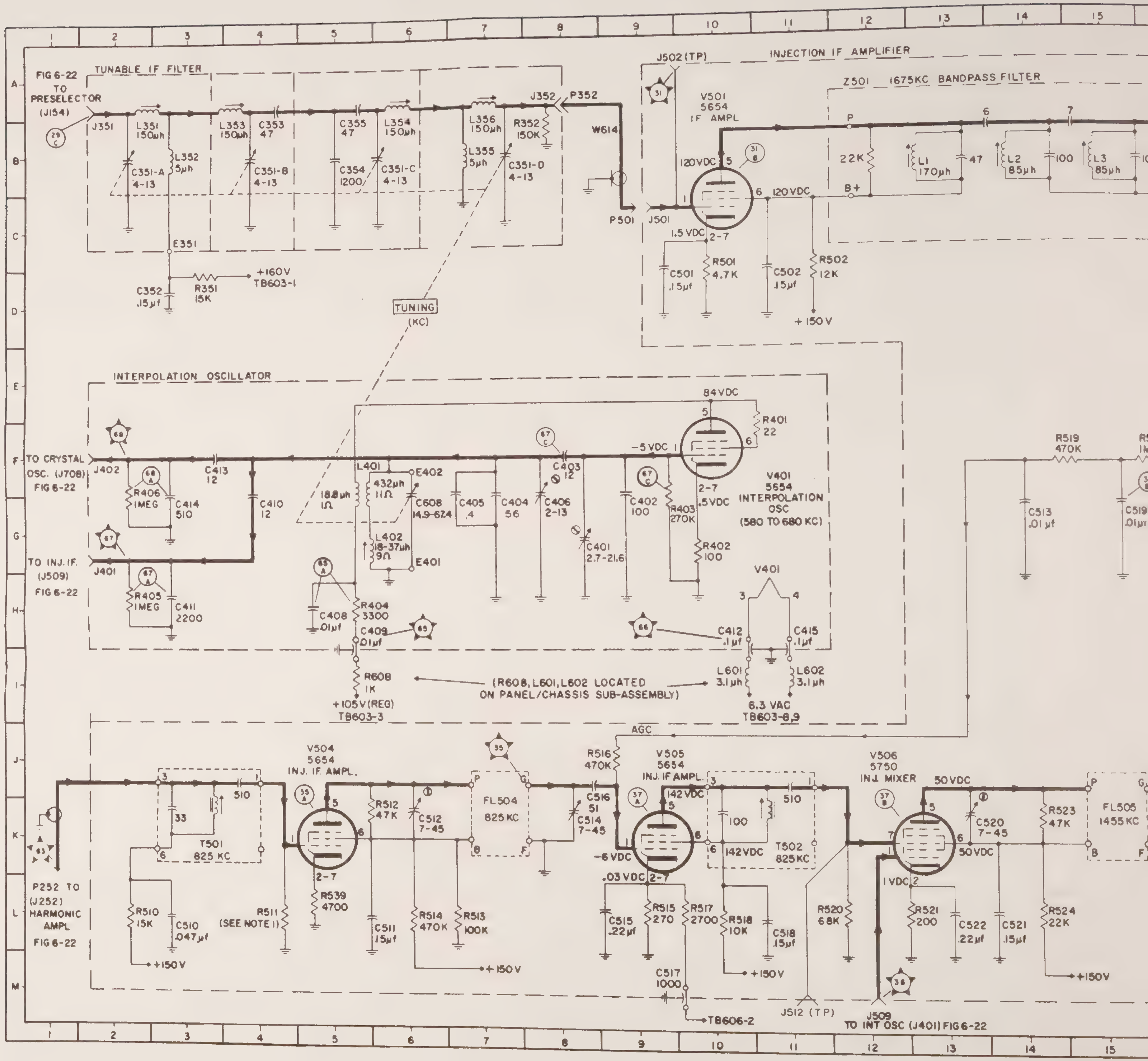
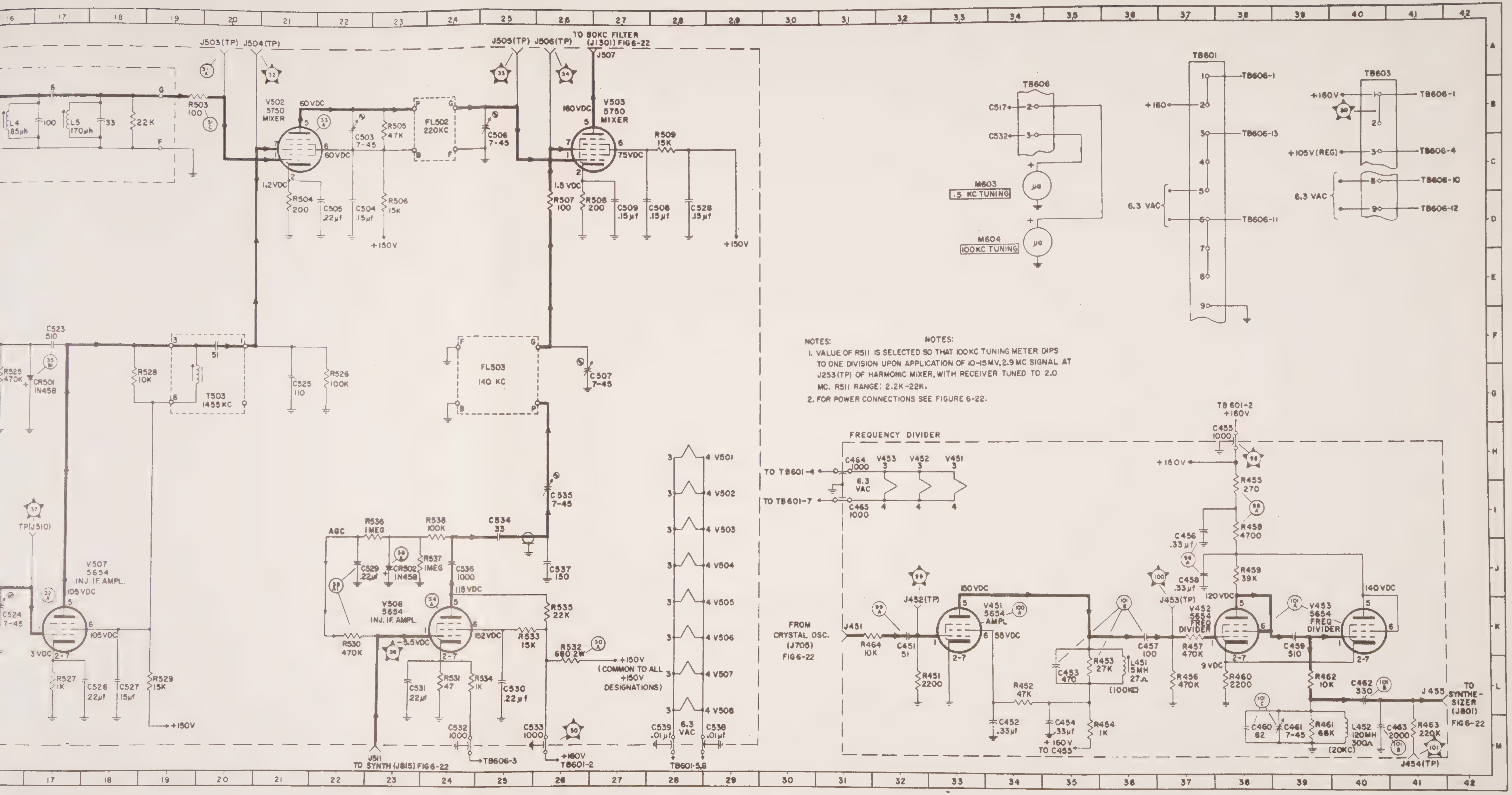


FIG 6-22 TO PRESELECTOR (J154)
TUNABLE IF FILTER
J351
L351 150µh
L352 5µh
C351-A 4-13
L353 150µh
C353 47
C351-B 4-13
C355 47
C354 1200
L354 150µh
C351-C 4-13
L356 150µh
L355 5µh
R352 150K
C351-D 4-13
J352
P352
W614
P501
J501
E351
C352 .15µf
R351 15K
+160V TB603-1
TUNING (KC)
J502 (TP)
INJECTION IF AMPLIFIER
V501 5654 IF AMPL
120VDC
1.5 VDC
120 VDC
C501 .15µf
R501 4.7K
C502 .15µf
R502 12K
+ 150 V
Z501 1675KC BANDPASS FILTER
P
B+
22K
L1 170µh
47
L2 85µh
100
L3 85µh
INTERPOLATION OSCILLATOR
TO CRYSTAL OSC. (J708) FIG 6-22
J402
R406 1MEG
C414 510
C413 12
C410 12
TO INJ. IF. (J509) FIG 6-22
J401
R405 1MEG
C411 2200
L401
18.8µh 1Ω
432µh 11Ω
E402
C608 14.9-67.4
L402 18-37µh 9Ω
E401
C405 .4
C404 56
C406 2-13
C403 12
C401 2.7-21.6
C402 100
R403 270K
84VDC
R401 22
-5 VDC
.5VDC
V401 5654 INTERPOLATION OSC (580 TO 680 KC)
R402 100
V401
C412 .1µf
C415 .1µf
L601 3.1µh
L602 3.1µh
6.3 VAC TB603-8,9
C408 .01µf
R404 3300
C409 .01µf
R608 1K
+105V (REG) TB603-3
(R608, L601, L602 LOCATED ON PANEL/CHASSIS SUB-ASSEMBLY)
R519 470K
C513 .01µf
C519 .01µf
AGC
P252 TO (J252) HARMONIC AMPL FIG 6-22
T501 825 KC
33
510
R510 15K
C510 .047µf
+150V
R511 (SEE NOTE 1)
V504 5654 INJ. IF AMPL.
R539 4700
R512 47K
C512 7-45
C511 .15µf
R514 470K
R513 100K
+ 150V
FL504 825 KC
C514 7-45
C516 51
R516 470K
V505 5654 INJ. IF AMPL.
142VDC
-6VDC
.03 VDC
R515 270
R517 2700
C515 .22µf
C517 1000
TB606-2
100
510
142VDC
T502 825KC
R518 10K
C518 .15µf
+150V
J512 (TP)
R520 68K
V506 5750 INJ. MIXER
50VDC
1 VDC
C520 7-45
R521 200
C522 .22µf
C521 .15µf
R523 47K
R524 22K
+150V
FL505 1455KC
J509 TO INT OSC (J401) FIG 6-22



NOTES:

1. VALUE OF R511 IS SELECTED SO THAT 100KC TUNING METER DIPS TO ONE DIVISION UPON APPLICATION OF 10-15MV, 2.9MC SIGNAL AT J253(TP) OF HARMONIC MIXER, WITH RECEIVER TUNED TO 2.0 MC. R511 RANGE: 2.2K-22K.
2. FOR POWER CONNECTIONS SEE FIGURE 6-22.

J503(TP)
J504(TP)
J505(TP)
J506(TP)
TO 80KC FILTER (J1301) FIG 6-22
J507
V502 5750 MIXER
60 VDC
1.2 VDC
R503 100
L4 85μh
L5 170μh
22K
R505 47K
C503 7-45
FL502 220KC
C506 7-45
R504 200
C505 .22μf
C504 .15μf
R506 15K
+150V
V503 5750 MIXER
160 VDC
75VDC
1.5 VDC
R509 15K
R507 100
R508 200
C509 .15μf
C508 .15μf
C528 .15μf
+150V
C523 510
R525 470K
CR501 1N458
R528 10K
T503 1455 KC
C525 110
R526 100K
FL503 140 KC
C507 7-45
C535 7-45
TP(J510)
V507 5654 INJ. IF AMPL.
105 VDC
C524 7-45
3 VDC
R527 1K
C526 .22μf
C527 .15μf
R529 15K
+150V
AGC
R536 1MEG
R538 100K
C534 33
C529 .22μf
CR502 1N458
R537 1MEG
C536 1000
115 VDC
C537 150
V508 5654 INJ. IF AMPL.
-5.5VDC
152VDC
R535 22K
R530 470K
R533 15K
R532 680 2W
+150V (COMMON TO ALL +150V DESIGNATIONS)
C531 .22μf
R531 47
R534 1K
C530 .22μf
C532 1000
C533 1000
J511 TO SYNTH (J815) FIG 6-22
TB606-3
+160V TB601-2
V501 V502 V503 V504 V505 V506 V507 V508
C539 .01μf
6.3 VAC
C538 .01μf
TB601-5,8
TB606
C517
C532
M603 .5 KC TUNING
M604 100KC TUNING
TB601
TB606-1
+160
TB606-13
6.3 VAC
TB606-11
TB603
+160V
TB606-1
+105V(REG)
TB606-4
6.3 VAC
TB606-10
TB606-12
TB 601-2 +160V
C455 1000
FREQUENCY DIVIDER
TO TB601-4
TO TB601-7
C464 1000
C465 1000
6.3 VAC
V453 V452 V451
+160V
R455 270
R458 4700
C456 .33μf
R459 39K
C458 .33μf
FROM CRYSTAL OSC. (J705) FIG 6-22
J451
R464 10K
C451 51
J452(TP)
150VDC
V451 5654 AMPL
55VDC
R451 2200
C453 470
R453 27K
L451 5MH 27Ω
(100KC)
R452 47K
C452 .33μf
C454 .33μf
R454 1K
+160V TO C455
C457 100
J453(TP)
120VDC
V452 5654 FREQ DIVIDER
9VDC
R457 470K
R456 470K
R460 2200
140VDC
V453 5654 FREQ DIVIDER
C459 510
R462 10K
C462 330
C460 82
C461 7-45
R461 68K
L452 120MH 300Ω
(20KC)
C463 2000
R463 220K
J455 TO SYNTHESIZER (J801) FIG 6-22
J454(TP)

Figure 6—16. Converter, Lower Deck (Tunable IF Filter, Interpolation Oscillator, Injection IF Amplifier, Frequency Divider), Schematic Diagram

TABLE 6-7. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-17

SYMBOL ND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V701	V		1.6	3.1ac	3.1ac	155	1.6			
5654	R	92	220			40k	220			
V702	V		2	3.1ac	3.1ac	68	2			
5654	R	1m	3.3k			180k	3.3k			
V703	V		7.2	3.1ac	3.1ac	175				
6005	R	110k	220			20k	110k			
V704	V	−2	0	3.1ac	3.1ac	20	1.5			
5749	R	440k	0			170k	100			
V705	V	—.45	0	3.1ac	3.1ac	41	.5			
5749	R	470k	0			50k	150			
V706	V		0	3.1ac	3.1ac	62	2			
5749	R	22k	0			35k	1k			
V707	V	3.1ac	4		122	148	0	4	3.1ac	
5670	R		680	10k	60k	35k	1k	680		
V708	V	3.1ac	4		124	148	0	4	3.1ac	
5670	R		680	1k	55k	35k	1.2k	680		
V709	V	−2	.05	3.1ac	3.1ac	32	.05			
5654	R	2.7m	100			6.8k	100			
V801	V	−2	0	3.1ac	3.1ac	155	45	0		
5654	R	470k	0			25k	38k	0		
V802	V	110	0	11	3.1ac	3.1ac	140k	0	11	3.1ac
5814A	R	50k	110k	1.8k			24k	5.6k	1.8k	
V803	V	100	0	14	3.1ac	3.1ac	137	0	14	3.1ac
5814A	R	90k	230k	4.7k			30k	10k	4.7k	
V804	V	109	—17	0	3.1ac	3.1ac	91	—.83	0	3.1ac
5751	R	80k	2.2m	0			60k	22k	0	
V805	V	3.1ac	5.5	—11	43		43	—3	0	3.1ac
5670	R		22k	1m	220k		220k	330k	0	
V806	V	0	3	3.1ac	3.1ac	95	95			
5750	R	inf	470			22k	22k	22k		
V807	V	0	2.5	3.1ac	3.1ac	110	110	2.5		
5654	R	240	390			30k	30k	390		
V902	V	105						0		
OB2WA	R							0		
V903	V	105						0		
OB2WA	R							0		

k = kilohm

m = megohm

NOTE

1. All resistance measurements made with the power off and interconnecting cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.
4. Crystal Oscillator cold on Resistance Measurements. (V701 thru V707 measurements only.)
5. TUNING switch in .5 kc position. (V801 thru V807 measurements only.)

TABLE 6-7. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-17

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V701	V		1.6	3.1ac	3.1ac	155	1.6			
5654	R	92	220			40k	220			
V702	V		2	3.1ac	3.1ac	68	2			
5654	R	1m	3.3k			180k	3.3k			
V703	V		7.2	3.1ac	3.1ac	175				
6005	R	110k	220			20k	110k			
V704	V	−2	0	3.1ac	3.1ac	20	1.5			
5749	R	440k	0			170k	100			
V705	V	−.45	0	3.1ac	3.1ac	41	.5			
5749	R	470k	0			50k	150			
V706	V		0	3.1ac	3.1ac	62	2			
5749	R	22k	0			35k	1k			
V707	V	3.1ac	4		122	148	0	4	3.1ac	
5670	R		680	10k	60k	35k	1k	680		
V708	V	3.1ac	4		124	148	0	4	3.1ac	
5670	R		680	1k	55k	35k	1.2k	680		
V709	V	−2	.05	3.1ac	3.1ac	32	.05			
5654	R	2.7m	100			6.8k	100			
V801	V	−2	0	3.1ac	3.1ac	155	45	0		
5654	R	470k	0			25k	38k	0		
V802	V	110	0	11	3.1ac	3.1ac	140k	0	11	3.1ac
5814A	R	50k	110k	1.8k			24k	5.6k	1.8k	
V803	V	100	0	14	3.1ac	3.1ac	137	0	14	3.1ac
5814A	R	90k	230k	4.7k			30k	10k	4.7k	
V804	V	109	—17	0	3.1ac	3.1ac	91	—.83	0	3.1ac
5751	R	80k	2.2m	0			60k	22k	0	
V805	V	3.1ac	5.5	—11	43		43	—3	0	3.1ac
5670	R		22k	1m	220k		220k	330k	0	
V806	V	0	3	3.1ac	3.1ac	95	95			
5750	R	inf	470			22k	22k	22k		
V807	V	0	2.5	3.1ac	3.1ac	110	110	2.5		
5654	R	240	390			30k	30k	390		
V902	V	105						0		
OB2WA	R							0		
V903	V	105						0		
OB2WA	R							0		

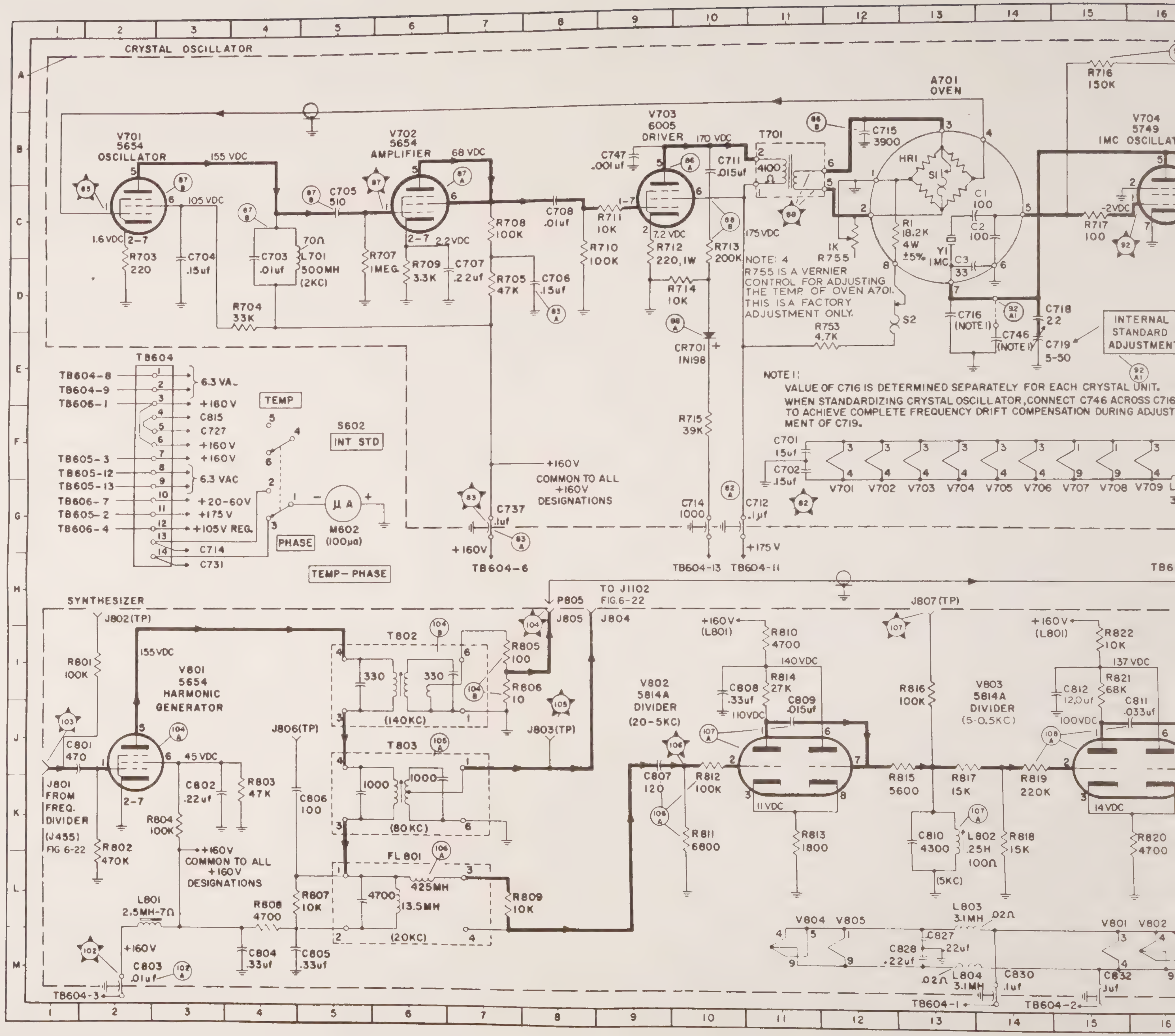
k = kilohm

m = megohm

NOTE

1. All resistance measurements made with the power off and interconnecting cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.
4. Crystal Oscillator cold on Resistance Measurements. (V701 thru V707 measurements only.)
5. TUNING switch in .5 kc position. (V801 thru V807 measurements only.)

A701	C13
C701	F11
C702	F11
C703	C4
C704	C3
C705	C5
C706	D8
C707	D7
C708	C8
C709	G17
C710	G17
C711	B10
C712	G11
C714	G10
C715	B12
C716	D13
C717	A17
C718	D14
C719	E14
C720	G18
C721	D17
C722	C18
C723	B19
C724	D20
C725	C22
C726	A21
C727	G33
C728	E26
C729	C24
C730	B26
C731	A26
C732	C27
C733	G34
C734	B28
C735	B29
C736	D29
C737	G7
C738	B31
C739	B31
C740	C34
C741	D34
C742	E37
C743	B36
C744	E35
C745	G36
C746	E14
C747	B9
C801	J1
C802	K3
C803	M2
C804	M4
C805	M5
C806	K5
C807	K9
C808	I10
C809	J11
C810	K13
C811	J16
C812	I15
C813	L19
C814	J19
C815	M27
C816	I20
C817	J21
C818	L27
C819	K27
C820	J23
C821	K25
C822	K26
C823	I26
C824	K28
C825	J28
C826	K29
C827	M13
C828	M13
C829	K30
C830	M14
C831	K31
C832	M15
C833	K33
C834	K34
C835	I35
C836	I34
C901A	K38
C901B	K39
C902A	J40
C902B	J41
C951	D39
C952	D40
CR701	E10
CR702	A20
CR703	D26
CR901	I38
CR902	I37
CR903	I38
CR904	I37
FL801	L6
FL802	K18
FL803	J29
FL804	J32
J705	B37
J707	B37
J708	G32
J709	G27
J801	J1
J804	H8
J805	H8
J811	H30
J815	H35
J951	F38
J952	F41
J953	F41
J954	F41
J956	D41
J957	C42
J958	B41
L701	C4
L702	F17
L703	G16
L704	D22
L705	D30
L706	D33
L707	D36
L801	L2
L802	K13
L803	L13
L804	M13
L805	J35
L901	I39
M602	G5
P805	H8
P811	H30
R1	C12
R703	D2
R704	D4
R705	D7
R707	D5
R708	C7
R709	D6
R710	D8
R711	C9
R712	C9
R713	C10
R714	D10
R715	F10
R716	A15
R717	C15
R718	C18
R719	A17
R720	D18
R721	D18
R722	D19
R723	D19
R724	A22
R725	B18
R726	D21
R727	D21
R728	G25
R729	A20
R730	D23
R731	D23
R732	D25
R733	D25
R734	D27
R735	D28
R736	D29
R737	B28
R738	A30
R739	C30
R740	A28
R741	C30
R742	D31
R743	D32
R744	B31
R745	A31
R746	C33
C747	D33
R748	D34
R749	E36
R750	D35
R751	D36
R752	E36
R753	E12
R754	C37
R801	I2
R802	L2
R803	K4
R804	K3
R805	I7
R806	J7
R807	L5
R808	L4
R809	L7
R810	I11
R811	K10
R812	J10
R813	K11
R814	I11
R815	J13
R816	I13
R817	J13
R818	K14
R819	J14
R820	K16
R821	I15
R822	I15
R823	K17
R824	J18
R825	L19
R826	K19
R827	K20
R828	I20
R829	I21
R830	I22
R831	L27
R832	K23
R833	K27
R834	K24
R835	K24
R836	J26
R837	K26
R838	J27
R839	J29
R840	K31
R841	K32
R842	K33
R843	K34
R844	K35
R901	K38
R902	L39
R903	J41
R904	I41
S1	C13
S2	E13
S602	F4
S603	E30
S701	F24
T701	B11
T801	K26
T802	I6
T803	J6
T901	I37
(TP)	
J702	B26
(TP)	
J703	G29
(TP)	
J706	A34
(TP)	
J802	H2
(TP)	
J803	J8
(TP)	
J806	J4
(TP)	
J807	H13
(TP)	
J808	H18
(TP)	
J809	H26
(TP)	
J810	H30
(TP)	
J812	H31
(TP)	
J813	H33
(TP)	
J814	H34
V701	C2
V702	C6
V703	C9
V704	C16
V705	C20
V706	C23
V707	C28
V708	C31
V709	C35
V801	J2
V802	J11
V803	J15
V804	J21
V805	J25
V806	J31
V807	J34
V901	K37
V902	L40
V903	K41
Y1	C13


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
A
B
C
D
E
F
G
H
I
J
K
L
M
CRYSTAL OSCILLATOR
V701
5654
OSCILLATOR
155 VDC
105 VDC
1.6 VDC
2-7
R703
220
C704
.15uf
C703
.01uf
70Ω
L701
500MH
(2KC)
R704
33K
C705
510
V702
5654
AMPLIFIER
68 VDC
2.2VDC
R707
1MEG
R709
3.3K
C707
.22uf
R708
100K
R705
47K
C706
.15uf
C708
.01uf
R711
10K
R710
100K
C747
.001uf
V703
6005
DRIVER
170 VDC
C711
.015uf
7.2 VDC
R712
220,1W
R713
200K
R714
10K
175VDC
T701
4100
C715
3900
A701
OVEN
HR1
S1
R1
18.2K
4W
±5%
Y1
1MC
C1
100
C2
100
C3
33
1K
R755
R753
4.7K
S2
C716
(NOTE 1)
C746
(NOTE 1)
C718
22
C719
5-50
INTERNAL STANDARD ADJUSTMENT
R716
150K
V704
5749
1MC OSCILLAT
R717
100
-2VDC
CR701
1N198
R715
39K
C701
15uf
C702
.15uf
V701
V702
V703
V704
V705
V706
V707
V708
V709
TB604
TB604-8
TB604-9
TB606-1
TB605-3
TB605-12
TB605-13
TB606-7
TB605-2
TB606-4
6.3 VA
+160 V
C815
C727
+160 V
+160 V
6.3 VAC
+20-60V
+175 V
+105V REG.
C714
C731
TEMP
S602
INT STD
PHASE
TEMP-PHASE
μA
M602
(100μa)
+160V
COMMON TO ALL +160V DESIGNATIONS
C737
.1uf
+160V
TB604-6
C714
1000
C712
.1uf
+175 V
TB604-13
TB604-11
TO J1102
FIG.6-22
P805
J805
J804
SYNTHESIZER
J802(TP)
R801
100K
155VDC
V801
5654
HARMONIC
GENERATOR
C801
470
45 VDC
C802
.22uf
R803
47K
R804
100K
J801
FROM
FREQ.
DIVIDER
(J455)
FIG 6-22
R802
470K
+160V
COMMON TO ALL +160V DESIGNATIONS
L801
2.5MH-7Ω
+160V
C803
.01uf
TB604-3
J806(TP)
C806
100
R808
4700
C804
.33uf
C805
.33uf
R807
10K
T802
330
330
(140KC)
R805
100
R806
10
T803
1000
1000
(80KC)
J803(TP)
FL801
4700
13.5MH
425MH
(20KC)
R809
10K
V802
5814A
DIVIDER
(20-5KC)
C807
120
R812
100K
R811
6800
+160V
(L801)
R810
4700
140VDC
C808
.33uf
R814
27K
C809
.015uf
110VDC
11VDC
R813
1800
J807(TP)
R816
100K
R815
5600
R817
15K
C810
4300
L802
.25H
100Ω
(5KC)
R818
15K
V803
5814A
DIVIDER
(5-0.5KC)
R819
220K
+160V
(L801)
R822
10K
137VDC
R821
68K
C812
12.0uf
C811
.033uf
100VDC
14VDC
R820
4700
L803
3.1MH
.02Ω
V804
V805
C827
.22uf
C828
.22uf
L804
3.1MH
.02Ω
C830
.1uf
V801
V802
C832
.1uf
TB604-1
TB604-2
TB6

NOTE: 4
R755 IS A VERNIER CONTROL FOR ADJUSTING THE TEMP. OF OVEN A701. THIS IS A FACTORY ADJUSTMENT ONLY.

NOTE 1:
VALUE OF C716 IS DETERMINED SEPARATELY FOR EACH CRYSTAL UNIT.
WHEN STANDARDIZING CRYSTAL OSCILLATOR, CONNECT C746 ACROSS C716 TO ACHIEVE COMPLETE FREQUENCY DRIFT COMPENSATION DURING ADJUSTMENT OF C719.

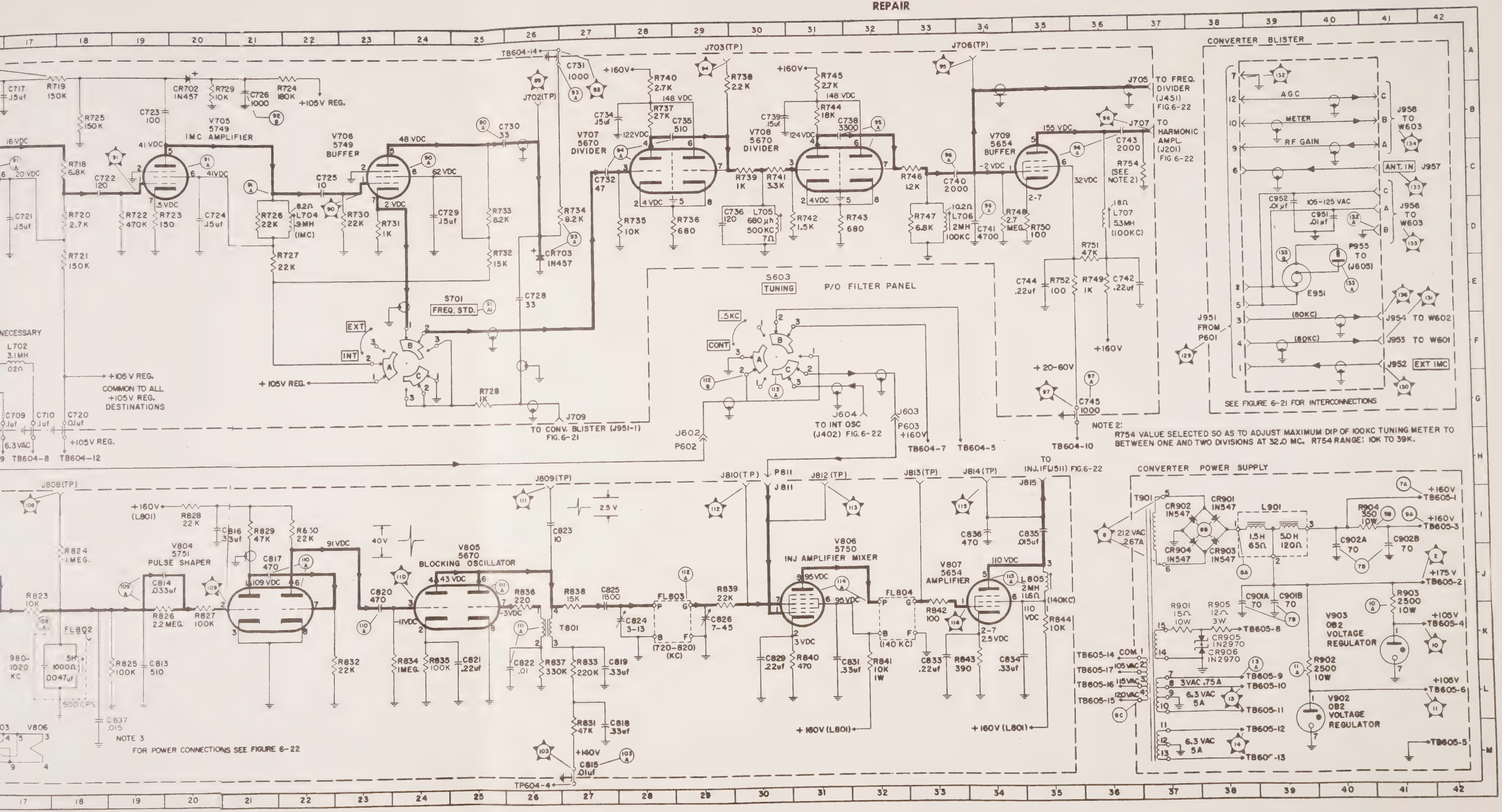

V705 5749 IMC AMPLIFIER
V706 5749 BUFFER
V707 5670 DIVIDER
V708 5670 DIVIDER
V709 5654 BUFFER
S701 FREQ. STD.
EXT
INT
S603 TUNING
P/O FILTER PANEL
.5KC
CONT
J703(TP)
J706(TP)
J702(TP)
J705 TO FREQ. DIVIDER (J451) FIG.6-22
J707 TO HARMONIC AMPL. (J201) FIG 6-22
J709 TO CONV. BLISTER (J951-1) FIG.6-21
J604 TO INT OSC (J402) FIG.6-22
J602 P602
J603 P603
+105V REG.
COMMON TO ALL +105V REG. DESTINATIONS
NECESSARY
NOTE 2:
R754 VALUE SELECTED SO AS TO ADJUST MAXIMUM DIP OF 100KC TUNING METER TO BETWEEN ONE AND TWO DIVISIONS AT 32.0 MC. R754 RANGE: 10K TO 39K.
CONVERTER BLISTER
AGC
METER
RF GAIN
ANT. IN J957
J958 TO W603
J956 TO W603
P955 TO (J605)
E951
J951 FROM P601
J954 TO W602
J953 TO W601
J952 EXT IMC
SEE FIGURE 6-21 FOR INTERCONNECTIONS
V804 5751 PULSE SHAPER
V805 5670 BLOCKING OSCILLATOR
V806 5750 INJ AMPLIFIER MIXER
V807 5654 AMPLIFIER
FL802
FL803
FL804
T801
J808(TP)
J809(TP)
J810(TP)
J812(TP)
J813(TP)
J814(TP)
P811 J811
J815 TO INJ. IF(J511) FIG.6-22
(720-820) (KC)
(140KC)
+160V (L801)
NOTE 3
FOR POWER CONNECTIONS SEE FIGURE 6-22
TP604-4
CONVERTER POWER SUPPLY
T901
CR901 IN547
CR902 IN547
CR903 IN547
CR904 IN547
L901
CR905 IN2970
CR906 IN2970
V903 OB2 VOLTAGE REGULATOR
V902 OB2 VOLTAGE REGULATOR
212 VAC .267A
+160V TB605-1
+160V TB605-3
+175 V TB605-2
+105V TB605-4
+105V TB605-6
TB605-5
TB605-8
TB605-9
TB605-10
TB605-11
TB605-12
TB605-13
TB605-14
TB605-15
TB605-16
TB605-17
TB604-7
TB604-5
TB604-8
TB604-10
TB604-12
TB604-14

Figure 6–17. Converter, Upper Deck, Schematic Diagram

TABLE 6-8. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-18

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V1601	V	0	7	3.1ac	3.1ac	165	165	7		
5654	R	inf	5k			35k	30k	5k		
V1602	V	.45	1.3	3.1ac	3.1ac	42	42_0	1.3		
5654	R	670k	470			60k	60k	470		
V1603	V	.45	1.3	3.1ac	3.1ac	42	42	1.3		
5654	R	670k	470			60k	60k	470		
V1604	V		2.3	3.1ac	3.1ac	115	115	2.3		
5654	R	550k	220			25k	25k	220		
V1605	V	0	1.7	3.1ac	3.1ac	168	85	1.7		
5654	R	27k	220			60k	60k	220		
V1606	V	0	3.7	3.1ac	3.1ac	152	135	0		
5725	R	1k	1k			20k	20k	220k		
V1607	V	0	1.3	3.1ac	3.1ac	52	52	1.3		
5654	R	0	470			60k	60k	470	6.5	3.1ac
V1608	V	110	—7.5	0	3.1ac	3.1ac	95	4	3.9k	
12AT7A	R	10k	2.2m	0			260k	1m		
V1609	V		7.5	3.1ac	3.1ac	142	170			
6005	R	500k	220			30k	30k	500k		
V1610	V		0	3.1ac	3.1ac			0		
5654	R	220k	0			100	100	0		
V1611	V	105	0		0	105		0		
0B2WA	R	10k	0		0	10k		0		

k = kilohm

m = megohm

inf = infinity

NOTE

1. All resistance measurements made with the power off and interconnecting cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.
4. AM/SSB switch in AM position.

TABLE 6-8. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-18

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V1601	V	0	7	3.1ac	3.1ac	165	165	7		
5654	R	inf	5k			35k	30k	5k		
V1602	V	.45	1.3	3.1ac	3.1ac	42	42	1.3		
5654	R	670k	470			60k	60k	470		
V1603	V	.45	1.3	3.1ac	3.1ac	42	42	1.3		
5654	R	670k	470			60k	60k	470		
V1604	V		2.3	3.1ac	3.1ac	115	115	2.3		
5654	R	550k	220			25k	25k	220		
V1605	V	0	1.7	3.1ac	3.1ac	168	85	1.7		
5654	R	27k	220			60k	60k	220		
V1606	V	0	3.7	3.1ac	3.1ac	152	135	0		
5725	R	1k	1k			20k	20k	220k		
V1607	V	0	1.3	3.1ac	3.1ac	52	52	1.3		
5654	R	0	470			60k	60k	470	6.5	3.1ac
V1608	V	110	—7.5	0	3.1ac	3.1ac	95	4	3.9k	
12AT7A	R	10k	2.2m	0			260k	1m		
V1609	V		7.5	3.1ac	3.1ac	142	170			
6005	R	500k	220			30k	30k	500k		
V1610	V		0	3.1ac	3.1ac			0		
5654	R	220k	0			100	100	0		
V1611	V	105	0		0	105		0		
0B2WA	R	10k	0		0	10k		0		

k = kilohm

m = megohm

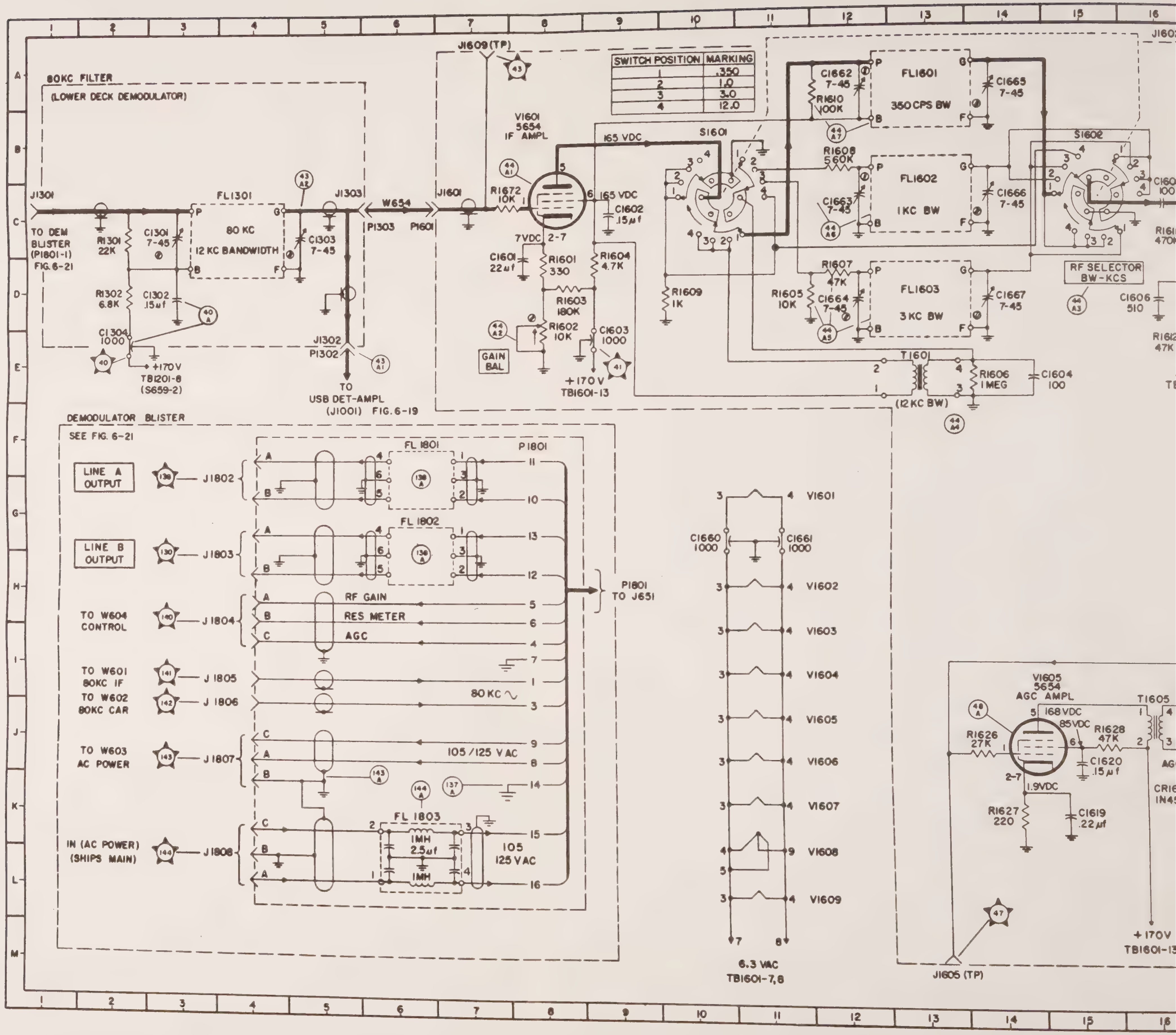
inf = infinity

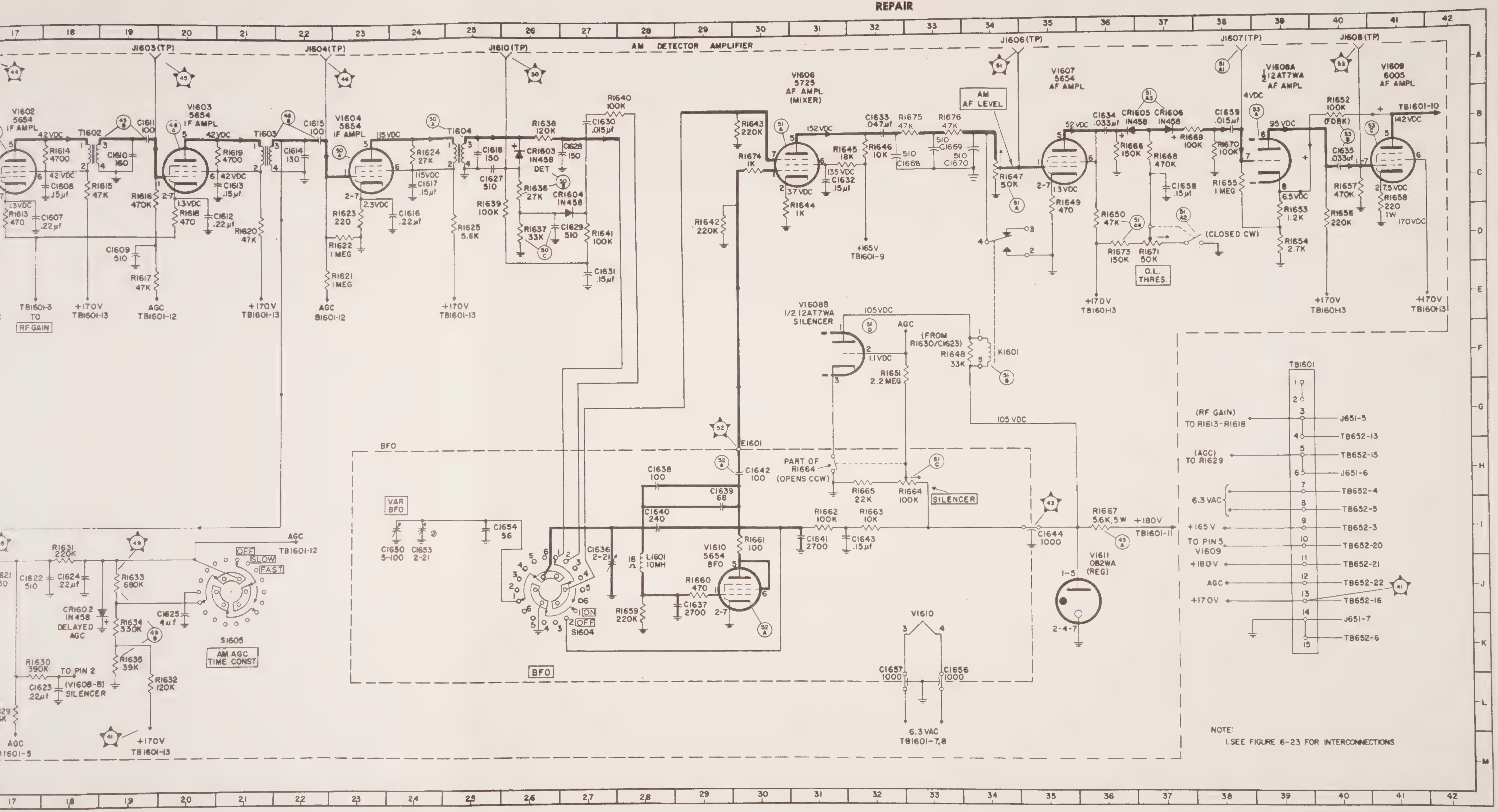
NOTE

1. All resistance measurements made with the power off and interconnecting cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.
4. AM/SSB switch in AM position.

251-252

C1301	C3
C1302	D3
C1303	C5
C1304	E2
C1601	D8
C1602	C9
C1603	E9
C1604	E15
C1605	C16
C1606	D16
C1607	D17
C1608	C18
C1609	D19
C1610	C19
C1611	B19
C1612	D20
C1613	C21
C1614	C22
C1615	B22
C1616	D24
C1617	C24
C1618	C25
C1619	K15
C1620	J15
C1621	J17
C1622	J18
C1623	L18
C1624	J18
C1625	K20
C1626	J20
C1627	C25
C1628	C27
C1629	D26
C1630	B27
C1631	E27
C1632	C31
C1633	B32
C1634	B36
C1635	C40
C1636	J27
C1637	J29
C1638	H28
C1639	I29
C1640	I28
C1641	I31
C1642	H30
C1643	I32
C1644	I35
C1645	J23
C1646	J25
C1647	J24
C1648	J25
C1649	J25
C1650	I24
C1651	J24
C1652	K25
C1653	I24
C1654	I25
C1655	K25
C1656	L33
C1657	L32
C1658	C37
C1659	B38
C1660	G10
C1661	G11
C1662	A12
C1663	C12
C1664	D12
C1665	A14
C1666	C14
C1667	D14
CR1601	K16
CR1602	J18
CR1603	C26
CR1604	D27
CR1605	B37
CR1606	B37
F1801	L5
F1802	K5
FL1301	C4
FL1601	A13
FL1602	C13
FL1603	D13
FL1604	B33
FL1801	F6
FL1802	G6
FL1803	K6
J1301	C1
J1302	E5
J1303	C5
J1601	C7
J1609	A7
J1610	A26
J1802	G4
J1803	H4
J1804	H4
J1805	I4
J1806	J4
J1807	J4
J1808	L4
K1601	F34
L1601	J28
P1302	E5
P1303	C6
P1601	C6
P1801	H9
R1301	C2
R1302	D2
R1601	D8
R1602	E8
R1603	D8
R1604	D9
R1605	D12
R1606	E14
R1607	D12
R1608	B12
R1609	D10
R1610	A12
R1611	C16
R1612	E16
R1613	D17
R1614	B18
R1615	C18
R1616	C19
R1617	E19
R1618	R20
R1619	B21
R1620	D21
R1621	E22
R1622	D23
R1623	D23
R1624	C24
R1625	D25
R1626	J14
R1627	K14
R1628	J15
R1629	L17
R1630	L17
R1631	J18
R1632	L19
R1633	J19
R1634	K19
R1635	K19
R1636	C26
R1637	D26
R1638	B26
R1639	C26
R1640	B28
R1641	D27
R1642	D29
R1643	B30
R1644	C31
R1645	C32
R1646	B32
R1647	C34
R1648	F34
R1649	C35
R1650	D36
R1651	F33
R1652	B40
R1653	D39
R1654	D39
R1655	C38
R1656	D40
R1657	C40
R1658	D41
R1659	J28
R1660	J29
R1661	I30
R1662	I31
R1663	I32
R1664	H33
R1665	H32
R1666	C36
R1667	I36
R1668	C37
R1669	B38
R1670	C38
R1671	D37
R1672	C8
R1673	D36
R1674	C30
S1601	B10
S1602	B15
S1603	B29
S1604	K27
S1605	K21
T1601	E13
T1602	B18
T1603	B21
T1604	B25
T1605	J16
(TP) J1602	A16
(TP) J1603	A19
(TP) J1604	A22
(TP) J1605	M13
(TP) J1606	A34
(TP) J1607	A38
(TP) J1608	A40
V1601	C8
V1602	C17
V1603	C20
V1604	C23
V1605	J15
V1606	C31
V1607	C35
V1608A	C39
V1608B	F31
V1609	C41
V1610	J29
V1611	J36


80KC FILTER
(LOWER DECK DEMODULATOR)
J1301
TO DEM BLISTER (P1801-1) FIG. 6-21
R1301 22K
C1301 7-45
R1302 6.8K
C1302 .15uf
C1304 1000
+170V TB1201-8 (S659-2)
FL1301
80 KC
12 KC BANDWIDTH
C1303 7-45
J1303
W654
P1303
P1601
J1302
P1302
TO USB DET-AMPL (J1001) FIG. 6-19
J1609 (TP)
J1601
V1601 5654 IF AMPL
R1672 10K
165 VDC
C1602 .15uf
7VDC
C1601 22uf
R1601 330
R1603 180K
R1602 10K
R1604 4.7K
C1603 1000
GAIN BAL
+170V TB1601-13
SWITCH POSITION
MARKING
1 .350
2 1.0
3 3.0
4 12.0
S1601
R1609 1K
C1662 7-45
R1610 100K
FL1601 350 CPS BW
C1665 7-45
R1608 560K
C1663 7-45
FL1602 1KC BW
C1666 7-45
R1607 47K
R1605 10K
C1664 7-45
FL1603 3KC BW
C1667 7-45
T1601
R1606 1MEG
C1604 100
(12KC BW)
S1602
RF SELECTOR BW-KCS
C1606 510
DEMODULATOR BLISTER
SEE FIG. 6-21
LINE A OUTPUT
J1802
FL 1801
P1801
LINE B OUTPUT
J1803
FL 1802
TO W604 CONTROL
J1804
RF GAIN
RES METER
AGC
TO W601 80KC IF
J 1805
TO W602 80KC CAR
J 1806
80 KC
TO W603 AC POWER
J1807
105/125 VAC
IN (AC POWER) (SHIPS MAIN)
J1808
FL 1803
1MH
2.5uf
105 125 VAC
P1801 TO J651
V1601
C1660 1000
C1661 1000
V1602
V1603
V1604
V1605
V1606
V1607
V1608
V1609
6.3 VAC TB1601-7,8
V1605 5654 AGC AMPL
168VDC
85VDC
R1626 27K
R1628 47K
C1620 .15uf
1.9VDC
R1627 220
C1619 .22uf
T1605
+170V TB1601-1
J1605 (TP)
A B C D E F G H I J K L M
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16


AM DETECTOR AMPLIFIER
J1603(TP)
J1604(TP)
J1610(TP)
J1606(TP)
J1607(TP)
J1608(TP)
V1602 5654 IF AMPL
V1603 5654 IF AMPL
V1604 5654 IF AMPL
V1606 5725 AF AMPL (MIXER)
V1607 5654 AF AMPL
V1608A 1/2 12AT7WA AF AMPL
V1609 6005 AF AMPL
V1608B 1/2 12AT7WA SILENCER
V1610 5654 BFO
V1611 OB2WA (REG)
T1602
T1603
T1604
CR1603 1N458 DET
CR1604 1N458
CR1605 1N458
CR1606 1N458
CR1602 1N458 DELAYED AGC
AM AF LEVEL
R1647 50K
R1671 50K
O.L. THRES.
(CLOSED CW)
K1601
(FROM R1630/C1623)
PART OF R1664 (OPENS CCW)
R1664 100K
SILENCER
BFO
VAR BFO
C1650 5-100
C1653 2-21
C1654 56
L1601 10MH
S1604
ON
OFF
S1605
OFF
SLOW
FAST
AM AGC TIME CONST
E1601
R1667 5.6K, 5W
+180V TB1601-11
TB1601-3 TO RF GAIN
+170V TB1601-13
AGC TB1601-12
+165V TB1601-9
+170V TB1601-13
TB1601-10
TO PIN 2 (V1608-B) SILENCER
+170V TB1601-13
AGC TB1601-5
6.3 VAC TB1601-7,8
TB1601
(RF GAIN) TO R1613-R1618
(AGC) TO R1629
6.3 VAC
+165 V
TO PIN 5 V1609
+180V
AGC
+170V
J651-5
TB652-13
TB652-15
J651-6
TB652-4
TB652-5
TB652-3
TB652-20
TB652-21
TB652-22
TB652-16
J651-7
TB652-6
NOTE:
1. SEE FIGURE 6-23 FOR INTERCONNECTIONS

6—18. Demodulator, Upper Deck, Schematic Diagram

TABLE 6-9. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-19

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V1001	V		2.5	3.1ac	3.1ac	120	120	2.5		
5654	R	1m	330			15k	15k	330		
V1002	V			22.5	3.1ac	3.1ac				3.1ac
5751	R	inf/75k*	inf/75k*	8.2k						
V1003	V		4.5	3.1ac	3.1ac	142	142	4.5		
5654	R	1.7m	1000			15k	12k	1000		
V1004	V	0	7	3.1ac	3.1ac	152	152	7		
5654	R	100	5k			16k	12k	5k		
V1005	V	0	1.6	3.1ac	3.1ac	100	100	1.6		
5749	R	1m	0			12k	12k	150		
V1006	V	0	1.6	3.1ac	3.1ac	100	100	1.6		
5749	R	135k	150			15k	15k	150		
V1007	V	0	1.3	3.1ac	3.1ac	40	35	1.3		
5654	R		150			220k	520k	150		
V1008	V	—.2	6.2	3.1ac	3.1ac	137	150	—.2		
6005	R	470k	270			16k	17k	470k		
V1101	V	0	2.5	3.1ac	3.1ac	125	125	2.5		
5654	R	1.1m	330			12k	12k	330		
V1102	V			25	3.1ac	3.1ac				3.1ac
5751	R	inf/59k*	inf/59k*	8200	0	0				0
V1104	V	3.1ac	1.4	—.38	130	0	130	—.38	1.4	3.1ac
5670	R		100	470k	24k	0	24k	470k	100	
V1105	V		7.5	3.1ac	3.1ac	145	155	7.5		
5654	R	inf	5k			26k	22k	5k		
V1106	V		2	3.1ac	3.1ac	105	105	2		
5749	R	1m	150			24k	24k	150		
V1107	V		2	3.1ac	3.1ac	100	100	2		
5749	R	140k	150			25k	25k	150		
V1108	V		1.5	3.1ac	3.1ac	35	35	1.5		
5654	R		150			225k	680k	150		
V1109	V	—.16	7	3.1ac	3.1ac	160	165	—.16		
6005	R	470k	270			15k	15k	470k		

k = kilohm
m = megohm
*Measure resistance to ground using both polarities of ohmmeter.
inf = infinity

NOTE

1. All resistance measurements made with the power off and interconnecting cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.
4. RECEPTION switch in SSB position.

TABLE 6-9. VOLTAGE AND RESISTANCE MEASUREMENTS FOR FIG. 6-19

SYMBOL AND TYPE		PIN NUMBER								
		1	2	3	4	5	6	7	8	9
V1001	V		2.5	3.1ac	3.1ac	120	120	2.5		
5654	R	1m	330			15k	15k	330		
V1002	V			22.5	3.1ac	3.1ac				3.1ac
5751	R	inf/75k*	inf/75k*	8.2k						
V1003	V		4.5	3.1ac	3.1ac	142	142	4.5		
5654	R	1.7m	1000			15k	12k	1000		
V1004	V	0	7	3.1ac	3.1ac	152	152	7		
5654	R	100	5k			16k	12k	5k		
V1005	V	0	1.6	3.1ac	3.1ac	100	100	1.6		
5749	R	1m	0			12k	12k	150		
V1006	V	0	1.6	3.1ac	3.1ac	100	100	1.6		
5749	R	135k	150			15k	15k	150		
V1007	V	0	1.3	3.1ac	3.1ac	40	35	1.3		
5654	R		150			220k	520k	150		
V1008	V	—.2	6.2	3.1ac	3.1ac	137	150	—.2		
6005	R	470k	270			16k	17k	470k		
V1101	V	0	2.5	3.1ac	3.1ac	125	125	2.5		
5654	R	1.1m	330			12k	12k	330		
V1102	V			25	3.1ac	3.1ac				3.1ac
5751	R	inf/59k*	inf/59k*	8200	0	0				0
V1104	V	3.1ac	1.4	—.38	130	0	130	—.38	1.4	3.1ac
5670	R		100	470k	24k	0	24k	470k	100	
V1105	V		7.5	3.1ac	3.1ac	145	155	7.5		
5654	R	inf	5k			26k	22k	5k		
V1106	V		2	3.1ac	3.1ac	105	105	2		
5749	R	1m	150			24k	24k	150		
V1107	V		2	3.1ac	3.1ac	100	100	2		
5749	R	140k	150			25k	25k	150		
V1108	V		1.5	3.1ac	3.1ac	35	35	1.5		
5654	R		150			225k	680k	150		
V1109	V	—.16	7	3.1ac	3.1ac	160	165	—.16		
6005	R	470k	270			15k	15k	470k		

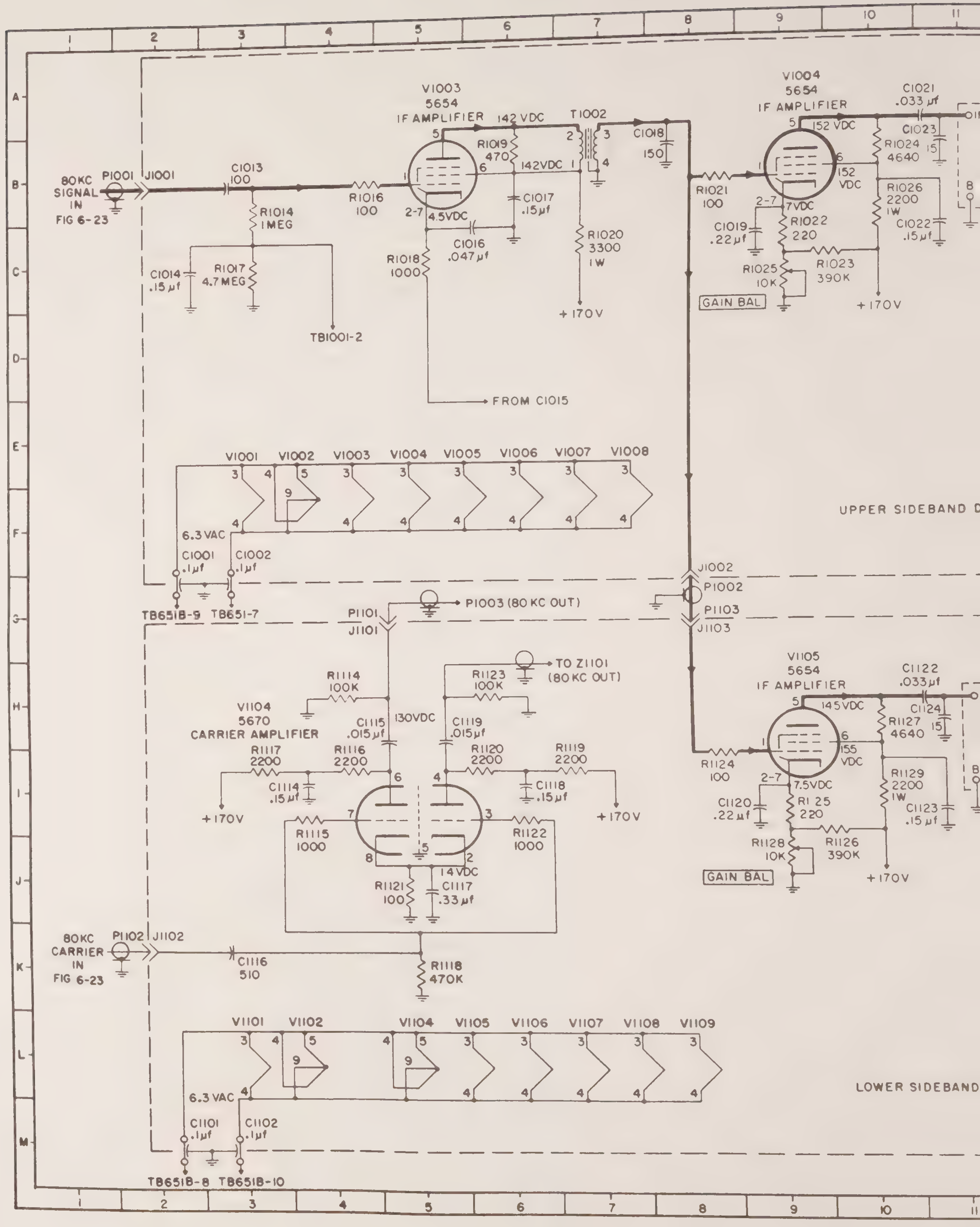
k = kilohm
*Measure resistance to ground using both polarities of ohmmeter.

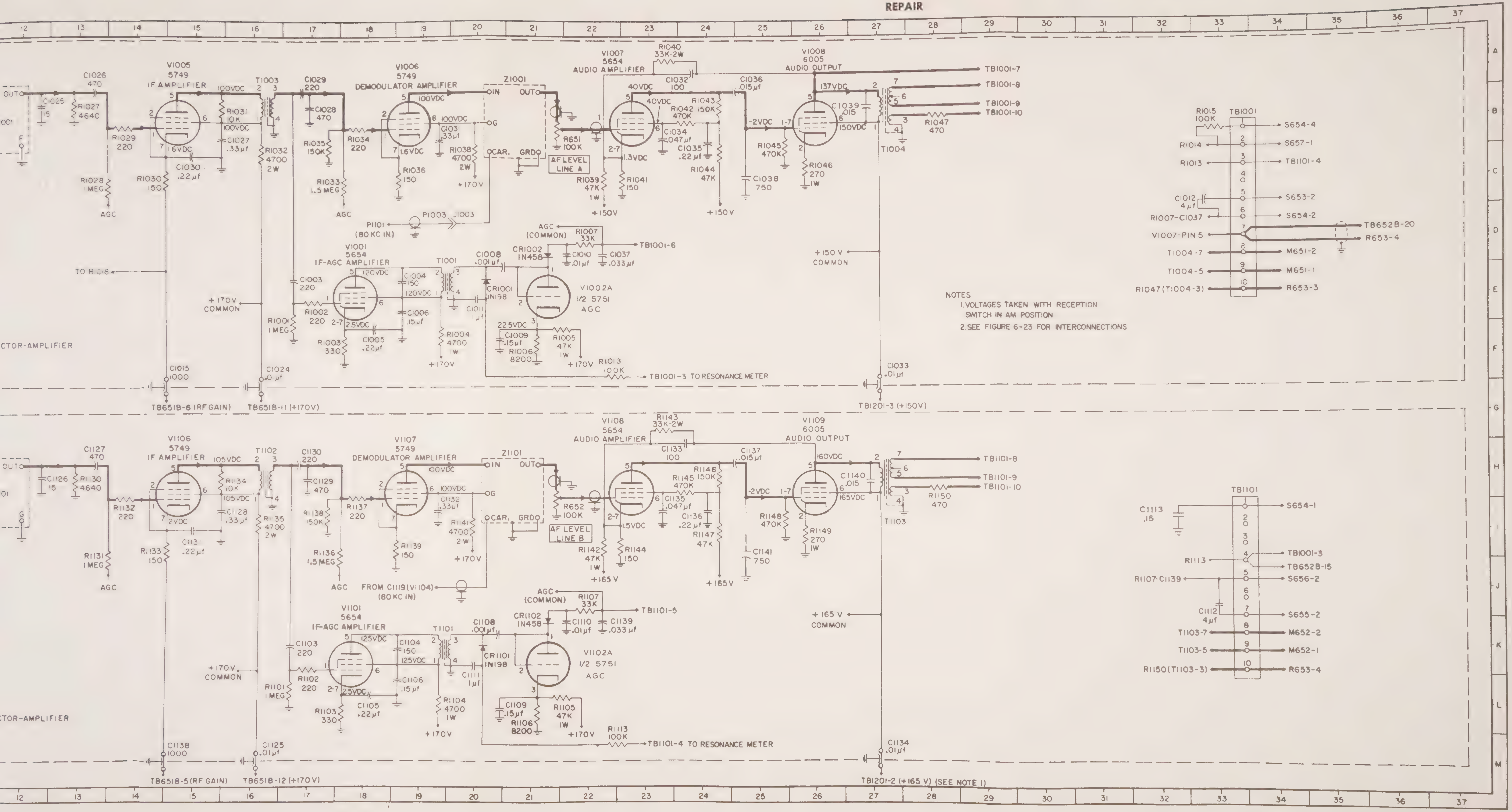
m = megohm
inf = infinity

NOTE

1. All resistance measurements made with the power off and interconnecting cables removed. Measurements are from tube pin to chassis.
2. All voltage measurements to chassis unless otherwise specified. Readings taken with multimeter having a resistance of 1,000 and 20,000 ohms per volt for ac and dc measurements respectively.
3. Operating controls preset according to table 5-2.
4. RECEPTION switch in SSB position.

C1001	G2	C1124	H11	R1023	C10	R1134	H15
C1002	G3	C1125	M16	R1024	B10	R1135	I16
C1003	E17	C1126	H12	R1025	C9	R1136	I17
C1004	E19	C1127	H13	R1026	B10	R1137	I18
C1005	F18	C1128	I15	R1027	B13	R1138	I17
C1006	E19	C1129	H17	R1028	C13	R1139	I19
C1008	D20	C1130	H17	R1029	B14	R1141	I20
C1009	F21	C1132	I19	R1030	C14	R1142	I22
C1010	D22	C1133	H23	R1031	B15	R1143	G23
C1011	E20	C1134	M27	R1032	B16	R1144	I22
C1012	D32	C1135	I23	R1033	C18	R1145	H24
C1013	B3	C1136	I24	R1034	B18	R1146	H24
C1014	C2	C1137	H25	R1035	B17	R1147	I24
C1015	F15	C1138	M15	R1036	C19	R1148	I25
C1016	C6	C1139	K22	R1038	C20	R1149	I26
C1017	B6	C1140	K27	R1039	C22	R1150	H28
C1018	B8	C1141	I25	R1040	A23		
C1019	C9			R1041	C23	T1001	E19
C1021	A11	CR1001	E20	R1042	B24	T1002	B7
C1022	C11	CR1002	D21	R1043	B24	T1003	B16
C1023	B11	CR1101	K20	R1044	C24	T1004	B27
C1024	F16	CR1102	K21	R1045	B25	T1101	K19
C1025	B12			R1046	C26	T1102	H16
C1026	A13	FL1001	B12	R1047	B28	T1103	H27
C1027	B15	FL1101	H12	R1101	L17		
C1028	B17			R1102	L17	V1001	E18
C1029	B17	J1001	B2	R1103	L18	V1002	E21
C1031	B19	J1002	F8	R1104	L19		E24
C1032	A24	J1003	D20	R1105	L22	V1003	B5
C1033	F27	J1101	G5	R1106	L21	V1004	B9
C1034	B23	J1102	K2	R1107	J22	V1005	B15
C1035	B24	J1103	G8	R1108	L24	V1006	B19
C1036	A25			R1109	L23	V1007	B23
C1037	D22	P1001	B2	R1110	K22	V1008	B26
C1038	C25	P1002	G8	R1111	L23	V1001	K18
C1039	B27	P1003	D19	R1112	L23	V1102	K21
C1101	M2	P1101	G5	R1113	M22	V1103	K29
C1102	M3	P1102	K2	R1114	H4	V1104	I5
C1103	K17	P1103	G8	R1115	I4	V1105	H9
C1104	K19			R1116	I4	V1106	H15
C1105	L18	R1001	E17	R1117	I3	V1107	H19
C1106	L19	R1002	E17	R1118	K5	V1108	H23
C1108	K20	R1003	F18	R1119	I7	V1109	H26
C1109	L20	R1004	F19	R1120	I6		
C1110	K22	R1005	F22	R1121	J5	Z1001	B21
C1111	L20	R1006	F21	R1122	I6	Z1101	H21
C1112	J33	R1007	D22	R1123	H6		
C1113	I31	R1013	F23	R1124	I8		
C1114	I4	R1014	C3	R1125	I9		
C1115	I5	R1015	B23	R1126	I10		
C1116	K3	R1016	B4	R1127	H10		
C1117	J5	R1017	C3	R1128	J9		
C1118	I6	R1018	C5	R1129	I10		
C1119	I5	R1019	B6	R1130	H13		
C1120	I9	R1020	C7	R1131	I13		
C1122	H11	R1021	B8	R1132	I14		
C1123	I11	R1022	C9	R1133	I14		


1 2 3 4 5 6 7 8 9 10 11
A B C D E F G H I J K L M
80KC SIGNAL IN FIG 6-23
P1001
J1001
C1013 100
R1014 1MEG
C1014 .15µf
R1017 4.7MEG
TB1001-2
R1016 100
V1003 5654 IF AMPLIFIER
142 VDC
R1019 470
142VDC
4.5VDC
C1017 .15µf
C1016 .047µf
R1018 1000
R1020 3300 1W
+170V
FROM C1015
T1002
C1018 150
V1004 5654 IF AMPLIFIER
152 VDC
R1021 100
7VDC
C1019 .22µf
R1022 220
R1025 10K
GAIN BAL
R1023 390K
R1024 4640
R1026 2200 1W
C1021 .033µf
C1023 15
C1022 .15µf
+170V
V1001 V1002 V1003 V1004 V1005 V1006 V1007 V1008
6.3 VAC
C1001 .1µf
C1002 .1µf
TB651B-9 TB651-7
UPPER SIDEBAND
J1002
P1002
P1103
J1103
P1101
J1101
P1003 (80 KC OUT)
R1114 100K
R1123 100K
TO Z1101 (80 KC OUT)
V1104 5670 CARRIER AMPLIFIER
C1115 .015µf
130VDC
C1119 .015µf
R1117 2200
R1116 2200
R1120 2200
R1119 2200
C1114 .15µf
C1118 .15µf
+170V
+170V
R1115 1000
R1122 1000
14VDC
R1121 100
C1117 .33µf
80KC CARRIER IN FIG 6-23
P1102 J1102
C1116 510
R1118 470K
V1105 5654 IF AMPLIFIER
145VDC
155 VDC
7.5VDC
R1124 100
C1120 .22µf
R1125 220
R1128 10K
GAIN BAL
R1126 390K
R1127 4640
R1129 2200 1W
C1122 .033µf
C1124 15
C1123 .15µf
+170V
V1101 V1102 V1104 V1105 V1106 V1107 V1108 V1109
6.3 VAC
C1101 .1µf
C1102 .1µf
TB651B-8 TB651B-10
LOWER SIDEBAND


V1005
5749
IF AMPLIFIER
T1003
C1029
220
V1006
5749
DEMODULATOR AMPLIFIER
Z1001
V1007
5654
AUDIO AMPLIFIER
R1040
33K-2W
V1008
6005
AUDIO OUTPUT
C1026
470
C1025
15
R1027
4640
R1029
220
R1028
1 MEG
AGC
R1030
150
C1030
.22 µf
R1031
10K
C1027
.33 µf
R1032
4700
2W
C1028
470
R1035
150K
R1034
220
R1033
1.5 MEG
R1036
150
C1031
.33 µf
R1038
4700
2W
+170V
R651
100K
AF LEVEL
LINE A
C1032
100
C1034
.047 µf
R1042
470K
R1043
150K
C1035
.22 µf
R1044
47K
R1039
47K
1W
R1041
150
+150V
C1036
.015 µf
R1045
470K
C1038
750
C1039
.015
R1046
270
1W
R1047
470
T1004
TB1001-7
TB1001-8
TB1001-9
TB1001-10
P1101
(80 KC IN)
P1003
J1003
V1001
5654
IF-AGC AMPLIFIER
T1001
C1008
.001 µf
CR1002
1N458
R1007
33K
C1010
.01 µf
C1037
.033 µf
TB1001-6
AGC
(COMMON)
TO R1018
C1003
220
C1004
150
CR1001
1N198
V1002A
1/2 5751
AGC
+170V
COMMON
R1002
220
R1001
1 MEG
R1003
330
C1005
.22 µf
C1006
.15 µf
R1004
4700
1W
C1011
1 µf
C1009
.15 µf
R1006
8200
R1005
47K
1W
R1013
100K
TB1001-3 TO RESONANCE METER
+150 V
COMMON
CTOR-AMPLIFIER
C1015
1000
C1024
.01 µf
TB651B-6 (RF GAIN)
TB651B-11 (+170V)
C1033
.01 µf
TB1201-3 (+150V)
R1015
100K
TB1001
S654-4
R1014
S657-1
R1013
TB1101-4
C1012
4 µf
S653-2
R1007-C1037
S654-2
V1007-PIN 5
TB652B-20
R653-4
T1004-7
M651-2
T1004-5
M651-1
R1047 (T1004-3)
R653-3
V1106
5749
IF AMPLIFIER
T1102
C1130
220
V1107
5749
DEMODULATOR AMPLIFIER
Z1101
V1108
5654
AUDIO AMPLIFIER
R1143
33K-2W
V1109
6005
AUDIO OUTPUT
C1127
470
C1126
15
R1130
4640
R1132
220
R1131
1 MEG
AGC
R1133
150
C1131
.22 µf
R1134
10K
C1128
.33 µf
R1135
4700
2W
C1129
470
R1138
150K
R1137
220
R1136
1.5 MEG
R1139
150
C1132
.33 µf
R1141
4700
2W
+170V
R652
100K
AF LEVEL
LINE B
C1133
100
C1135
.047 µf
R1145
470K
R1146
150K
C1136
.22 µf
R1147
47K
R1142
47K
1W
R1144
150
+165 V
C1137
.015 µf
R1148
470K
C1141
750
C1140
.015
R1149
270
1W
R1150
470
T1103
TB1101-8
TB1101-9
TB1101-10
FROM C1119 (V1104)
(80 KC IN)
V1101
5654
IF-AGC AMPLIFIER
T1101
C1108
.001 µf
CR1102
1N458
R1107
33K
C1110
.01 µf
C1139
.033 µf
TB1101-5
AGC
(COMMON)
C1103
220
C1104
150
CR1101
1N198
V1102A
1/2 5751
AGC
+170V
COMMON
R1102
220
R1101
1 MEG
R1103
330
C1105
.22 µf
C1106
.15 µf
R1104
4700
1W
C1111
1 µf
C1109
.15 µf
R1106
8200
R1105
47K
1W
R1113
100K
TB1101-4 TO RESONANCE METER
+165 V
COMMON
CTOR-AMPLIFIER
C1138
1000
C1125
.01 µf
TB651B-5 (RF GAIN)
TB651B-12 (+170V)
C1134
.01 µf
TB1201-2 (+165 V) (SEE NOTE 1)
TB1101
C1113
.15
S654-1
R1113
TB1001-3
TB652B-15
R1107-C1139
S656-2
C1112
4 µf
S655-2
T1103-7
M652-2
T1103-5
M652-1
R1150 (T1103-3)
R653-4
100VDC
1.6VDC
40VDC
1.3VDC
-2VDC
137VDC
150VDC
120VDC
2.5VDC
22.5VDC
105VDC
2VDC
1.5VDC
160VDC
165VDC
125VDC
IN
OUT
OG
CAR.
GRD
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
A
B
C
D
E
F
G
H
I
J
K
L
M

NOTES
1. VOLTAGES TAKEN WITH RECEPTION SWITCH IN AM POSITION
2. SEE FIGURE 6-23 FOR INTERCONNECTIONS

Figure 6–19. Demodulator, Lower Deck, Schematic Diagram

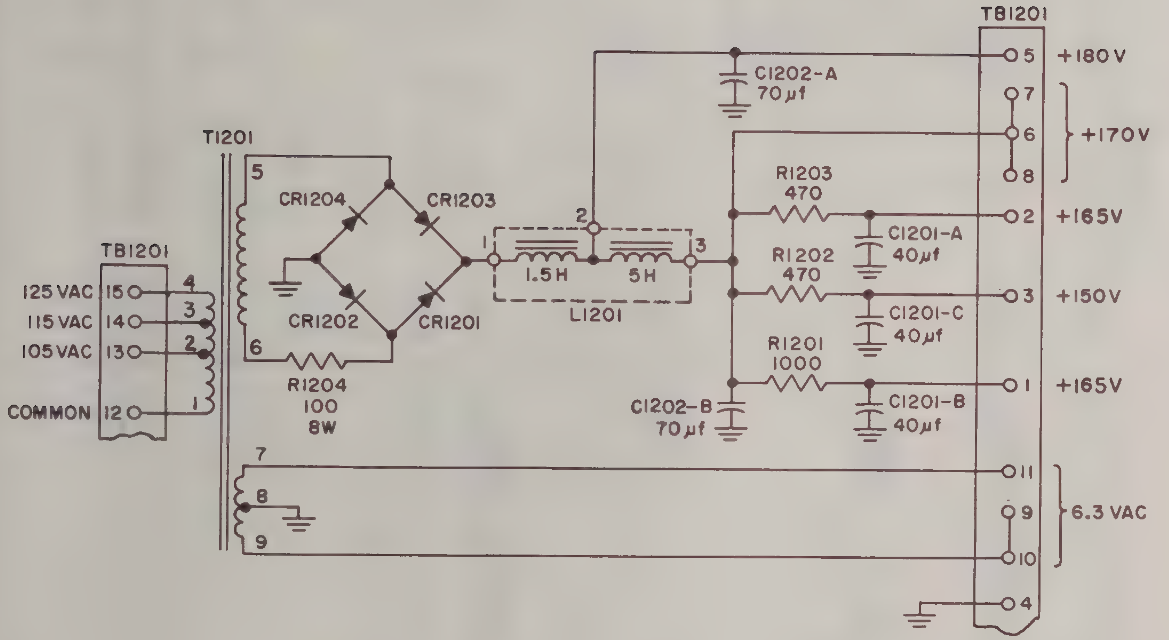

TB1201
125 VAC 15
115 VAC 14
105 VAC 13
COMMON 12
4
3
2
1
T1201
5
6
7
8
9
CR1204
CR1203
CR1202
CR1201
R1204
100
8W
1
2
3
1.5H
5H
L1201
C1202-A
70 μf
C1202-B
70 μf
R1203
470
R1202
470
R1201
1000
C1201-A
40μf
C1201-C
40μf
C1201-B
40μf
TB1201
5 +180 V
7
6 +170V
8
2 +165V
3 +150V
1 +165V
11
9 6.3 VAC
10
4

Figure 6-20. Demodulator Power Supply, Schematic Diagram

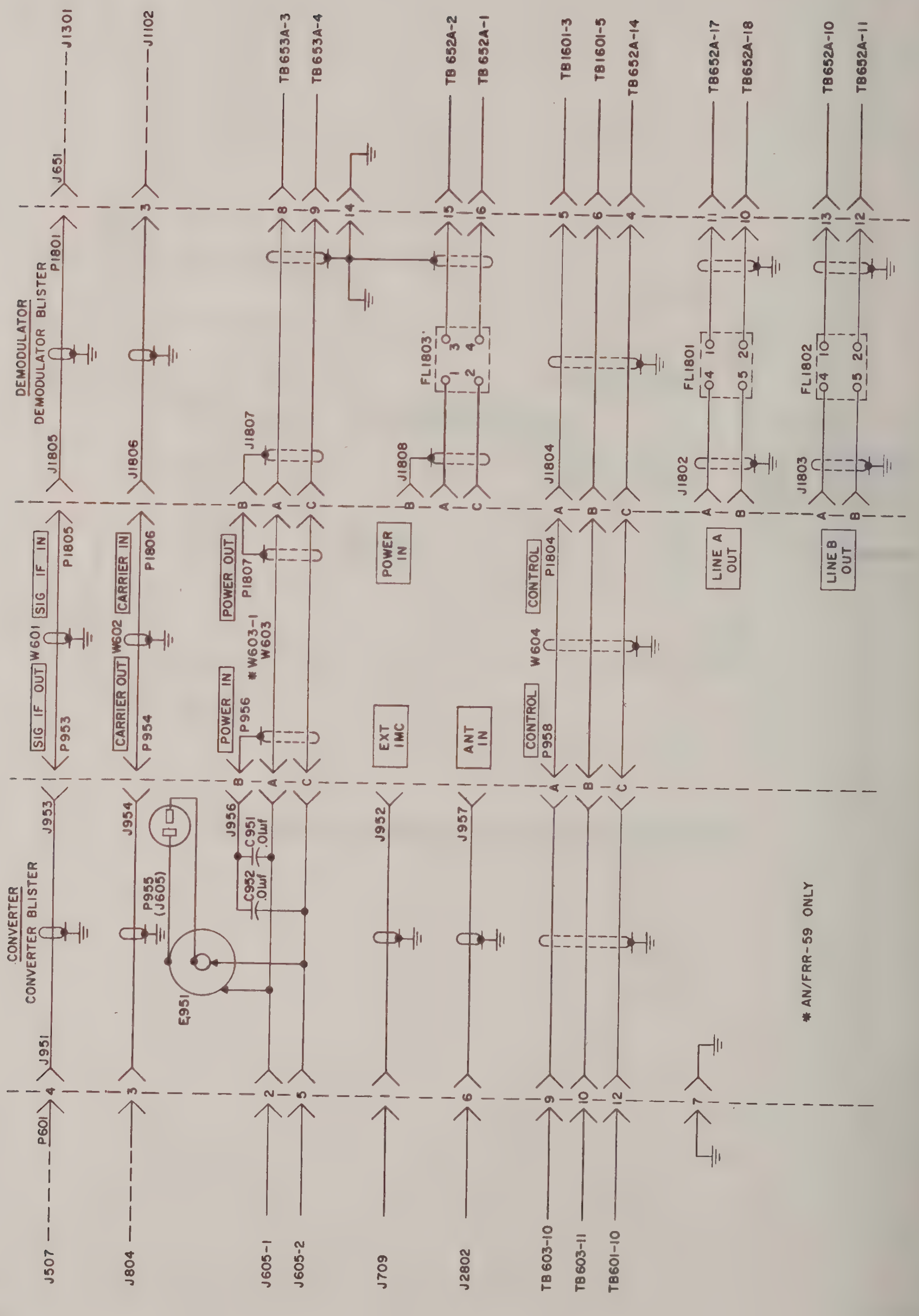
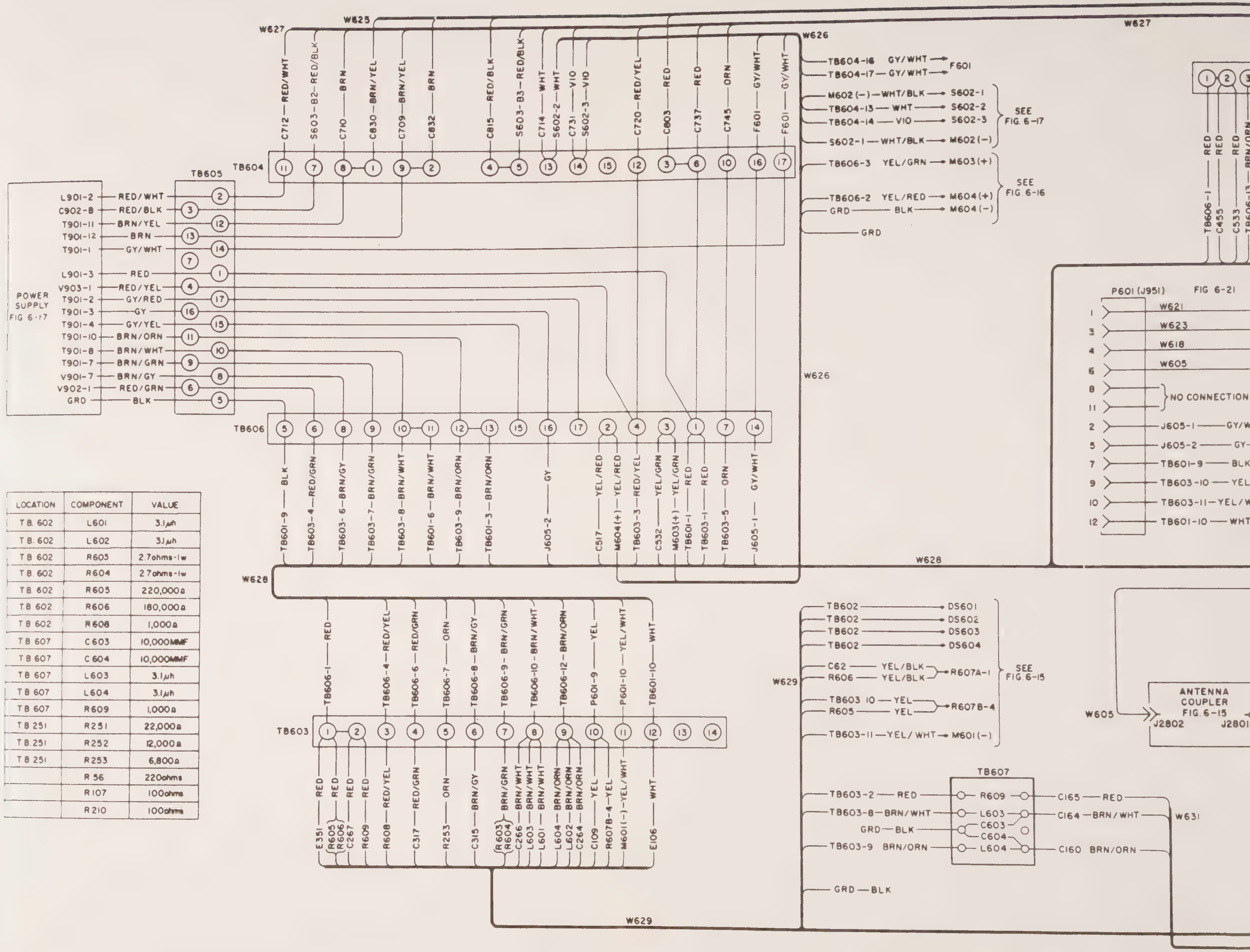

CONVERTER
CONVERTER BLISTER
DEMODULATOR
DEMODULATOR BLISTER
J507
J804
J605-1
J605-2
J709
J2802
TB603-10
TB603-11
TB601-10
P601
4
3
2
5
1
6
9
10
12
7
J951
E951
P955
(J605)
J953
J954
J956
C951
.01uf
C952
.01uf
J952
J957
A
B
C
SIG IF OUT
P953
CARRIER OUT
P954
POWER IN
P956
* W603-1
W603
EXT
IMC
ANT
IN
CONTROL
P958
W601
W602
W604
SIG IF IN
P1805
CARRIER IN
P1806
POWER OUT
P1807
POWER
IN
CONTROL
P1804
LINE A
OUT
LINE B
OUT
J1805
J1806
J1807
J1808
J1804
J1802
J1803
FL1803
1
2
3
4
FL1801
FL1802
O4
1O
O5
2O
P1801
8
9
14
15
16
11
13
J651
J1301
J1102
TB653A-3
TB653A-4
TB652A-2
TB652A-1
TB1601-3
TB1601-5
TB652A-14
TB652A-17
TB652A-18
TB652A-10
TB652A-11
* AN/FRR-59 ONLY

Figure 6–21. Converter and Demodulator Blisters Interconnections

255-300



W627
W625
W626
W628
W629
W605
W631
TB604
TB605
TB606
TB603
TB607
POWER SUPPLY FIG 6-17
L901-2 — RED/WHT
C902-B — RED/BLK
T901-11 — BRN/YEL
T901-12 — BRN
T901-1 — GY/WHT
L901-3 — RED
V903-1 — RED/YEL
T901-2 — GY/RED
T901-3 — GY
T901-4 — GY/YEL
T901-10 — BRN/ORN
T901-8 — BRN/WHT
T901-7 — BRN/GRN
V901-7 — BRN/GY
V902-1 — RED/GRN
GRD — BLK
TB604-16 GY/WHT → F601
TB604-17 — GY/WHT
M602(−) — WHT/BLK → S602-1
TB604-13 — WHT → S602-2
TB604-14 — VIO → S602-3
S602-1 — WHT/BLK → M602(−)
SEE FIG. 6-17
TB606-3 YEL/GRN → M603(+)
TB606-2 YEL/RED → M604(+)
GRD — BLK → M604(−)
SEE FIG. 6-16
GRD
P601 (J951) FIG 6-21
W621
W623
W618
W605
NO CONNECTION
J605-1 — GY/W
J605-2 — GY
TB601-9 — BLK
TB603-10 — YEL
TB603-11 — YEL/W
TB601-10 — WHT
TB602 → DS601
TB602 → DS602
TB602 → DS603
TB602 → DS604
C62 — YEL/BLK
R606 — YEL/BLK → R607A-1
TB603 10 — YEL
R605 — YEL → R607B-4
SEE FIG. 6-15
TB603-11 — YEL/WHT → M601(−)
ANTENNA COUPLER FIG. 6-15
J2802
J2801
TB603-2 — RED
TB603-8 — BRN/WHT
GRD — BLK
TB603-9 BRN/ORN
R609
L603
C603
C604
L604
C165 — RED
C164 — BRN/WHT
C160 BRN/ORN
GRD — BLK

LOCATION	COMPONENT	VALUE
T.B. 602	L601	3.1µh
T.B. 602	L602	3.1µh
T.B. 602	R603	2.7ohms-1w
T.B. 602	R604	2.7ohms-1w
T.B. 602	R605	220,000Ω
T.B. 602	R606	180,000Ω
T.B. 602	R608	1,000Ω
T.B. 607	C603	10,000MMF
T.B. 607	C604	10,000MMF
T.B. 607	L603	3.1µh
T.B. 607	L604	3.1µh
T.B. 607	R609	1,000Ω
T.B. 251	R251	22,000Ω
T.B. 251	R252	12,000Ω
T.B. 251	R253	6,800Ω
	R 56	220ohms
	R107	100ohms
	R210	100ohms

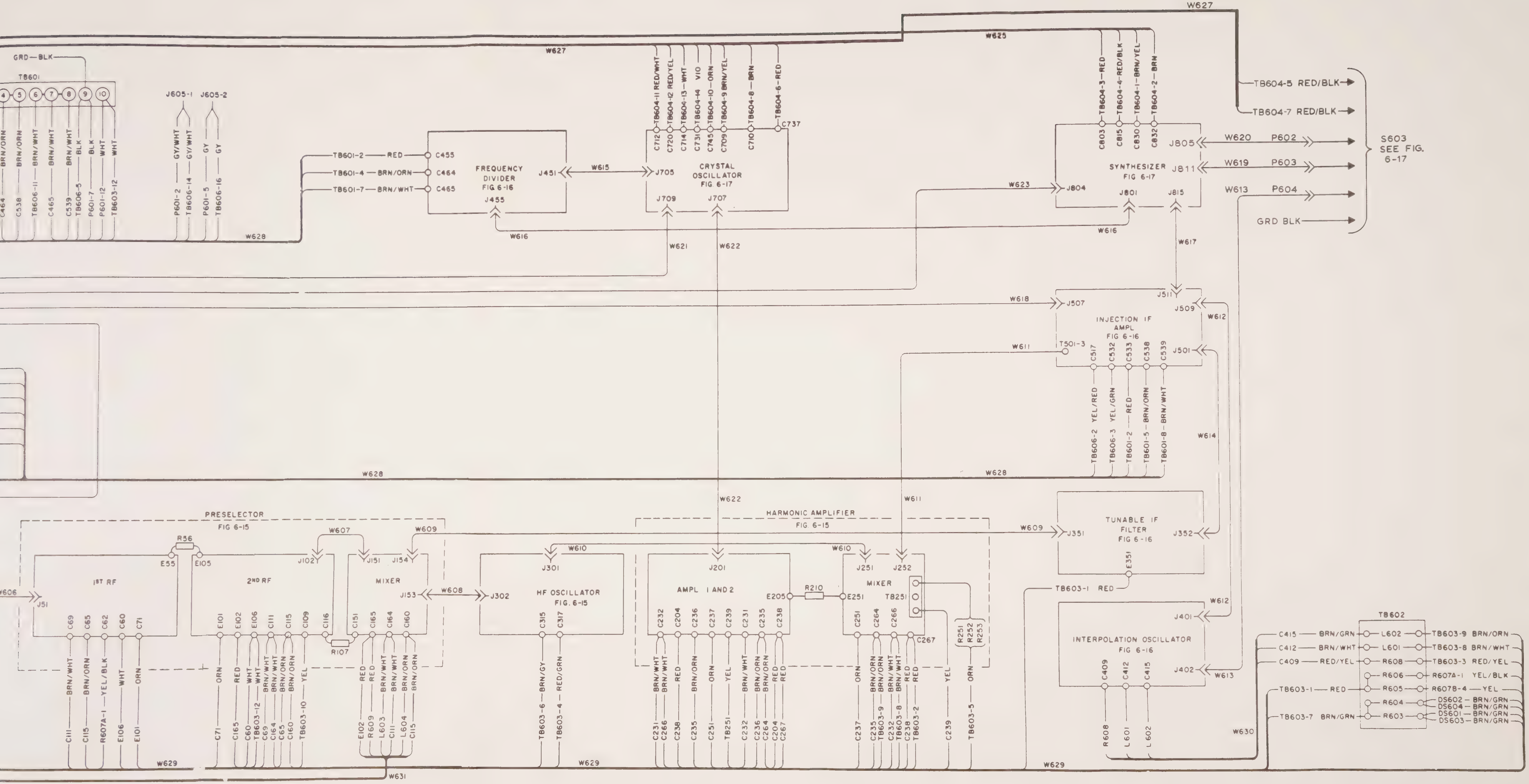
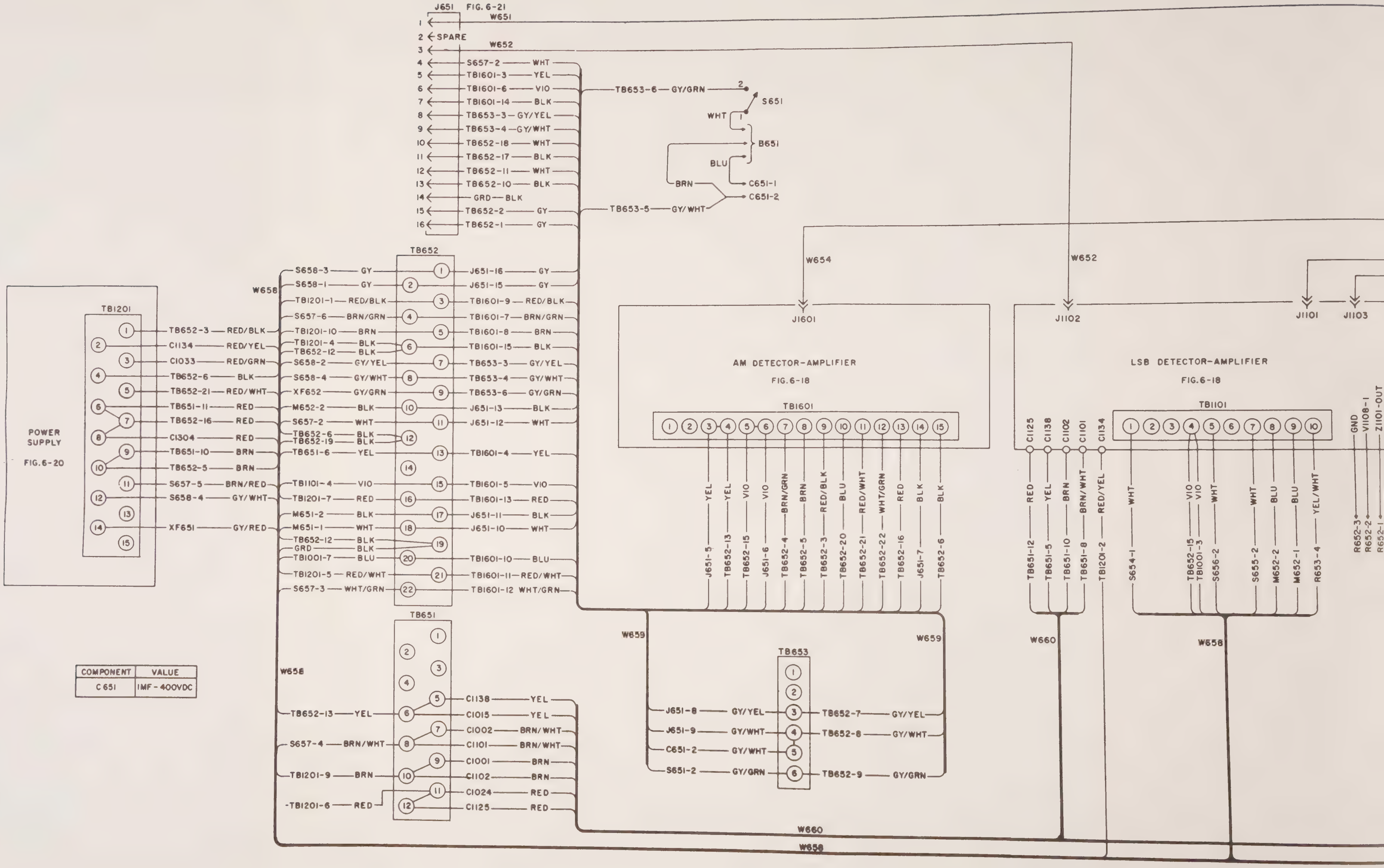

W627
W625
W627
GRD—BLK
TB601
J605-1
J605-2
TB604-11 RED/WHT
TB604-12 RED/YEL
TB604-13—WHT
TB604-14 VIO
TB604-10—ORN
TB604-9 BRN/YEL
TB604-8—BRN
TB604-6—RED
C737
TB604-3—RED
TB604-4—RED/BLK
TB604-1—BRN/YEL
TB604-2—BRN
TB604-5 RED/BLK
TB604-7 RED/BLK
TB601-2 — RED
TB601-4 — BRN/ORN
TB601-7 — BRN/WHT
C455
C464
C465
FREQUENCY DIVIDER FIG 6-16
J451
J455
W615
J705
CRYSTAL OSCILLATOR FIG 6-17
J709
J707
C712 C720 C714 C731 C745 C709 C710
C803 C815 C830 C832
J805
J811
W620 P602
W619 P603
W613 P604
GRD BLK
S603 SEE FIG. 6-17
SYNTHESIZER FIG 6-17
J804
J801
J815
W623
W616
W621
W622
W628
W617
W618
J507
J511
J509
W612
INJECTION IF AMPL FIG 6-16
W611
T501-3
C517 C532 C533 C538 C539
J501
TB606-2 YEL/RED
TB606-3 YEL/GRN
TB601-2 — RED
TB601-5 — BRN/ORN
TB601-8 — BRN/WHT
W614
W628
PRESELECTOR FIG 6-15
R56
E55
E105
W607
W609
J102
J151
J154
1ST RF
2ND RF
MIXER
W606
J51
J153
W608
J302
HF OSCILLATOR FIG. 6-15
J301
W610
HARMONIC AMPLIFIER FIG 6-15
J201
AMPL 1 AND 2
E205
R210
E251
J251
J252
MIXER
TB251
C267
R251 R252 R253
W609
J351
TUNABLE IF FILTER FIG 6-16
J352
E351
TB603-1 RED
J401
INTERPOLATION OSCILLATOR FIG 6-16
J402
W613
C409 C412 C415
R608 L601 L602
W630
TB602
C415 — BRN/GRN — L602 — TB603-9 BRN/ORN
C412 — BRN/WHT — L601 — TB603-8 BRN/WHT
C409 — RED/YEL — R608 — TB603-3 RED/YEL
R606 — R607A-1 YEL/BLK
R605 — R607B-4 — YEL
TB603-1 — RED
R604 — DS602 — BRN/GRN
DS604 — BRN/GRN
TB603-7 BRN/GRN — R603 — DS601 — BRN/GRN
DS603 — BRN/GRN
R107
W629
W631
W629
W629
TB603-6 — BRN/GY
TB603-4 — RED/GRN
C315 C317

Figure 6-22. Converter, Interconnecting Diagram

301-302


J651
FIG. 6-21
W651
SPARE
W652
S651
B651
C651-1
C651-2
W654
W652
J1601
J1102
J1101
J1103
AM DETECTOR-AMPLIFIER
FIG. 6-18
TB1601
LSB DETECTOR-AMPLIFIER
FIG. 6-18
TB1101
TB652
W658
TB1201
POWER SUPPLY
FIG. 6-20
TB651
W659
TB653
W660
W658

COMPONENT	VALUE
C651	1MF-400VDC

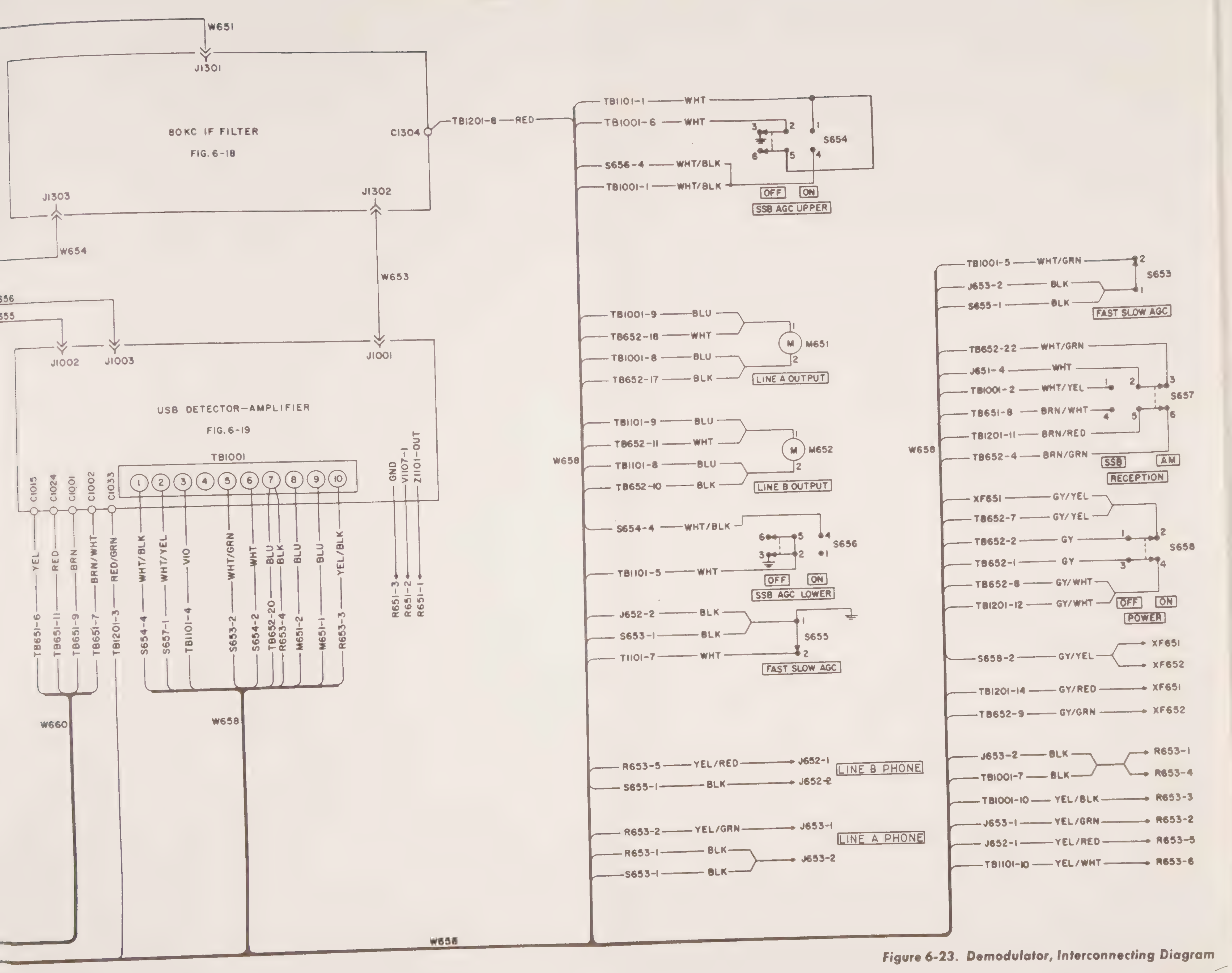

W651
J1301
80KC IF FILTER
FIG. 6-18
C1304
J1303
J1302
W654
W653
J1002
J1003
J1001
USB DETECTOR-AMPLIFIER
FIG. 6-19
TB1001
C1015
C1024
C1Q01
C1002
C1033
GND
V1107-1
Z1101-OUT
TB651-6 YEL
TB651-11 RED
TB651-9 BRN
TB651-7 BRN/WHT
TB1201-3 RED/GRN
S654-4 WHT/BLK
S657-1 WHT/YEL
TB1101-4 VIO
S653-2 WHT/GRN
S654-2 WHT
TB652-20 BLU
R653-4 BLK
M651-2 BLU
M651-1 BLU
R653-3 YEL/BLK
R651-3
R651-2
R651-1
W660
W658
TB1201-8 RED
TB1101-1 WHT
TB1001-6 WHT
S656-4 WHT/BLK
TB1001-1 WHT/BLK
S654
OFF
ON
SSB AGC UPPER
TB1001-9 BLU
TB652-18 WHT
TB1001-8 BLU
TB652-17 BLK
M651
LINE A OUTPUT
TB1101-9 BLU
TB652-11 WHT
TB1101-8 BLU
TB652-10 BLK
M652
LINE B OUTPUT
S654-4 WHT/BLK
TB1101-5 WHT
S656
SSB AGC LOWER
J652-2 BLK
S653-1 BLK
T1101-7 WHT
S655
FAST SLOW AGC
R653-5 YEL/RED J652-1
S655-1 BLK J652-2
LINE B PHONE
R653-2 YEL/GRN J653-1
R653-1 BLK
S653-1 BLK J653-2
LINE A PHONE
TB1001-5 WHT/GRN
J653-2 BLK
S655-1 BLK
S653
FAST SLOW AGC
TB652-22 WHT/GRN
J651-4 WHT
TB1001-2 WHT/YEL
TB651-8 BRN/WHT
TB1201-11 BRN/RED
TB652-4 BRN/GRN
S657
SSB
AM
RECEPTION
XF651 GY/YEL
TB652-7 GY/YEL
TB652-2 GY
TB652-1 GY
TB652-8 GY/WHT
TB1201-12 GY/WHT
S658
OFF
ON
POWER
S658-2 GY/YEL XF651 XF652
TB1201-14 GY/RED XF651
TB652-9 GY/GRN XF652
J653-2 BLK R653-1
TB1001-7 BLK R653-4
TB1001-10 YEL/BLK R653-3
J653-1 YEL/GRN R653-2
J652-1 YEL/RED R653-5
TB1101-10 YEL/WHT R653-6
W658
W658

Figure 6-23. Demodulator, Interconnecting Diagram

SECTION 7
PARTS LIST

7-1. INTRODUCTION.

Reference designations have been assigned to identify all maintenance parts of Radio Receiving Sets AN/WRR-2A and AN/FRR-59A. The two receivers are functionally identical, both consisting of Electronic Frequency Converter CV920A/URR (converter) and Intermediate Frequency-Audio Frequency Amplifier AM-2477A/URR (demodulator). Their only differences are that the AN/WRR-2A is equipped with Mounting MT-2293A/WRR-2 (mounting cradle) and the spacers between the converter and demodulator cabinets of the AN/FRR-59A are slightly larger than those of the AN/WRR-2A, making the former receiver slightly higher over-all.

The reference designations are attached to, or adjacent to, the parts they identify and are used on drawings, diagrams, and parts lists. Prefix letters indicate the kind of part, or generic group, such as resistor, electron tube, and the like. The number portion of the reference designation differentiates between part within the group.

Each major unit has been assigned a block of series numbers, and major circuits within them have been assigned blocks within those blocks. For example, the numbers in the converter block are 51 through 649, 701 through 999, and 2801 through 2899. Within the converter, the preselector first RF has the numbers 51 through 99, and the preselector second RF has 101 through 149.

A socket associated with a plug-in device, such as a fuse or an electron tube, carries the number of the device within its own. For example, the socket for electron tube V51 is designated XV51. The safe is true of a tube shield. The shield for tube V51 is designated EV51.

Stock Number Identification Tables (SNIT) or Allowance Parts List (APL) issued by the Electronics Supply Office include Federal Stock Numbers and Source Maintenance and Recoverability Codes. Therefore, reference shall be made to the appropriate SNIT or APL for this information.

7-2. LIST OF MANUFACTURERS.

a. NUMERICAL. — Table 7-1 lists the manufacturers of parts used in the receivers. The five-digit numbers are assigned by the Federal Supply Code for Manufacturers, Cataloging Handbook H4-1. These numbers are used in the descriptions column of table 7-3.

b. ALPHABETICAL. — Table 7-2 lists the manufacturers in alphabetical order for cross-reference purposes.

7-3. MAINTENANCE PARTS LIST.

Table 7-3 lists all major units and their maintenance parts.

Column 1 lists the reference series of each major unit, followed by the reference designations of their various parts in alphabetical and numerical order.

Column 2 contains references to explanatory notes given in paragraph 7-4.

Column 3 contains names and descriptions of various parts. Complete information is given for all key parts (parts differing from those listed before in the table) and for all subkey parts (those identical with a key part but appearing for the first time in the major unit list). Names and descriptions previously listed within the major unit are omitted, but reference is made to the key, or subkey, part.

Column 4 gives the function of the part and its functional location. The figure numbers in this column refer to illustrations throughout this manual.

7-4. EXPLANATORY NOTES.

1. Resistance can vary from 1K to 4.7 K ohms. Value of R511 is determined so that the 100 KC TUNING meter dips to one division upon application of a 2.9 mc signal (10 mv) at TPJ253 of harmonic mixer when the receiver is tuned to 2.0 mc.
2. Capacitance can vary from 1 to 47 uuf. Value of C716 is determined separately for each crystal unit. The procedure used to determine the value of C716 is included in the alignment procedure for the crystal oscillator. Refer to paragraph 6-3*a*(1).
3. Resistance can vary from 10 to 39K ohms. Value of R754 is determined to control maximum dip of 100 KC TUNING meter to between one and two divisions when the receiver is tuned to 32.0 mc.
4. Values determined by procedure given in paragraph 6-5*c*(2)(*e*).

TABLE 7-1. LIST OF MANUFACTURERS IN FEDERAL SUPPLY CODE ORDER

FS CODE	NAME	ADDRESS
00262	Valor Instruments, Inc.	Gardena, California
00656	Aerovox Corp.	New Bedford, Mass.
01121	Allen-Bradley Co.	Milwaukee, Wisc.
02660	Amphenol-Borg Electronics Corp.	Broadview (Chicago), Ill.
07786	Miller Research Laboratories	Baltimore, Maryland
19701	Electra Manufacturing Co.	Kansas City, Mo.
24446	General Electric Co.	Schenectady, N.Y.
25140	Globe Industries Inc.	Dayton, Ohio
42498	National Company, Inc.	Malden, Mass.
49671	Radio Corp. of America	New York, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
71450	Chicago Telephone Supply Co.	Elkhart, Ind.
71468	Cannon Electric Co.	Los Angeles, Calif.
71840	Clevite Corp.	Cleveland, Ohio
72136	Electro Motive Manufacturing Co.	Willimantic, Conn.
72619	Dialight Corp.	Brooklyn, New York
72982	Erie Resistor Corp.	Erie, Pa.
74545	Hubbell, Harvey, Inc.	Bridgeport, Conn.
74868	Industrial Products Co. Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.
75382	Kulka Electric Manufacturing Co., Inc.	Mount Vernon, N.Y.
75915	Littelfuse, Inc.	Des Plaines, Ill.
78277	Sigma Instruments Inc.	South Braintree, Mass.
80058	Communication Electronic Nomenclature Subpanel	Washington, D.C.
80131	Electronic Industries Association	Washington, D.C.
80294	Bourns Laboratories, Inc.	Riverside, California
80583	Hammarlund Co., Inc.	New York, N.Y.
81349	Military Specifications	Washington, D.C.
81350	Joint Army-Navy Specifications	Washington, D.C.
81716	Oak Manufacturing Co.	Crystal Lake, Illinois
81831	Filtron Co., Inc.	Flushing, Long Island, N.Y.
82376	Astron Co.	East Newark, N. J.
82647	Spencer Thermostat Division of Metals and Controls Corp.	Attleboro, Mass.
83125	Pyramid Electric Co.	North Bergen, N. J.
83827	Resistors Inc.	Chicago, Ill.
88044	Aeronautical Standards Group, Department of Navy and Air Force	Washington, D.C.
89819	Sickles, F. W., Co.	Chicopee, Mass.
91146	Cannon Electric Co., Eastern Division	Salem, Mass.
91662	Elco Corp.	Philadelphia, Pa.
91737	Gremar Mfg. Co., Inc.	Wakefield, Mass.
91984	Maida Development Co.	Hampton, Va.
94154	Tung-Sol Electric, Inc.	Newark, N. J.
96906	Military Standards	Washington, D.C.
98291	Sealectro Corp.	New Rochelle, N.Y.
98997	Sightmaster Corp.	New Rochelle, N.Y.

TABLE 7-2. LIST OF MANUFACTURERS, ALPHABETICAL

NAME	ADDRESS	FS CODE
Aeronautical Standards Group	Washington, D.C.	88044
Aerovox Corp.	New Bedford, Mass.	00656
Allen-Bradley Co.	Wilwaukee, Wisc.	01121
Amphenol-Borg Electronics Corp.	Broadview (Chicago), Ill.	02660
Astron Co.	East Newark, N. J.	82376
Bourns Laboratories, Inc.	Riverside, California	80294
Cannon Electric Co.	Los Angeles, Calif.	71468
Cannon Electric Co.	Salem, Mass.	91146
Chicago Telephone Supply Co.	Elkhart, Ind.	71450
Clevite Corp.	Cleveland, Ohio	71840
Communication Electronic Nomenclature Subpanel	Washington, D.C.	80058
Dialight Corporation	Brooklyn, New York	72619
Elco Corp.	Philadelphia, Pa.	91662
Electra Manufacturing Co.	Kansas City, Mo.	19701
Electro Motive Manufacturing Co.	Willimantic, Conn.	72136
Electronic Industries Association	Washington, D.C.	80131
Erie Resistor Corp.	Erie, Pa.	72982
Filtron Co., Inc.	Flushing, Long Island, N.Y.	81831
General Electric Co.	Schenectady, N.Y.	24446
Globe Industries Inc.	Dayton, Ohio	25140
Gremar Mfg. Co., Inc.	Wakefield, Mass.	91737
Hammarlund Co., Inc.	New York, N.Y.	80583
Hubbell, Harvey, Inc.	Bridgeport, Conn.	74545
Industrial Products Co. Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.	74868
Joint Army-Navy Specifications	Washington, D.C.	81350
Kulka Electric Manufacturing Co., Inc.	Mount Vernon, N.Y.	75382
Littelfuse, Inc.	Des Plaines, Ill.	75915
Maida Development Co.	Hampton, Va.	91984
Military Specifications	Washington, D.C.	81349
Military Standards	Washington, D.C.	96906
Miller Research Laboratories	Baltimore, Maryland	07786
National Co., Inc.	Malden, Mass.	42498
Oak Manufacturing Co.	Crystal Lake, Illinois	81716
Pyramid Electric Co.	North Bergen, N. J.	83125
Radio Corp. of America	New York, N.Y.	49671
Resistors Inc.	Chicago, Ill.	83827
Sealectro Corp.	New Rochelle, N.Y.	98291
Sickles, F. W., Co.	Chicopee, Mass.	89819
Sightmaster Corp.	New Rochelle, N.Y.	98997
Sigma Instruments Inc.	South Braintree, Mass.	78277
Spencer Thermostat Division of Metals and Controls Corp.	Attleboro, Mass.	82647
Sprague Electric Co.	North Adams, Mass.	56289
Tung-Sol Electric, Inc.	Newark, N. J.	94154
Valor Instruments, Inc.	Gardena, California	00262

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
51-199		PRESELECTOR: 2.0 to 32.0 mc in four bands, Band 1: 2.0 to 4.0 mc; Band 2: 4.0 to 8.0 mc; Band 3: 8.0 to 16.0 mc; Band 4: 16.0 to 32.0 mc; fil 6.3 vac, plate 160 vdc; c/o 3 tubes; tuning incremental in 100 kc steps; bandwidth 100 kc; 4 tuned circuits ganged together with HARMONIC AMPLIFIER tuned circuits and HIGH FREQUENCY OSCILLATOR tuned circuit; p/o Radio Receiving Set AN/WRR-2A.	
51-99		PRESELECTOR, FIRST R.F. ASSEMBLY: 42498 part no. A19586.	
C51		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type; 7.60 to 52.00 uuf; 07886 dwg/part no. A18242.	S51 Antenna Trimmer Figure 5-12
C52		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 vdc working 22 uuf. ±5%; type no. CC20CH220J, 91984 type.	S51 Input Padder Figure 5-12
C53		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 vdc working, 15 uuf. ±5%; type no. CC20CH150J, 91984 type.	L61 Input Padder Figure 5-12
C54		CAPACITOR, VARIABLE, AIR DIELECTRIC: plate meshing type, 1000 vdc working 2.6 to 21.5 uuf.; 89819 part no. ATM-21 locking.	L58 Trimmer Figure 5-12
C55		Same as C54.	L59 Trimmer Figure 5-12
C56		Same as C54.	L60 Trimmer Figure 5-12
C57		Same as C54.	L61 Trimmer Figure 5-12
C58		Same as C52.	V51 Input Padder Figure 5-12
C59		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 vdc working 100 uuf. ±2%; type no. CC32CG101G, 91984 type.	V51 Grid Coupling Figure 5-12
C60		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; type no. CK70A102M, 00656 type.	V51 Feedthru by-pass Figure 5-12
C61		CAPACITOR, FIXED, MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	V51 AGC by-pass Figure 5-12
C62		Same as C60.	V51 Cathode Feedthru by-pass Figure 5-12
C63		CAPACITOR, FIXED, PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 part no. 118P22402T15.	V51 Cathode by-pass Figure 5-12
C64		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500 vdc working 1500 uuf. −20 +100%; type no. CK61Y152Z, 82376 type.	V51 Heater by-pass Figure 5-12
C65		Same as C60.	V51 Feedthru by-pass Figure 5-12
C66		CAPACITOR, FIXED, PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 part no. 118P22402T12.	V51 Heater by-pass Figure 5-12
C67		CAPACITOR, FIXED, PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 part no. 118P15404T15.	V51 Screen by-pass Figure 5-12
C68		Same as C64.	V51 Heater by-pass Figure 5-12
C69		Same as C60.	V51 Feedthru by-pass Figure 5-12
C70		Same as C66.	V51 Heater by-pass Figure 5-12
C71		Same as C60.	V51 Screen Feedthru by-pass Figure 5-12

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
EV51		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	For V51 Figure 5-12
J51		CONNECTOR, RECEPTACLE ELECTRICAL: 1 rd. male contact, straight; 74868 part no. FXR95225.	Antenna Coupler Input (P51) Figure 5-12
J52		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; 74868 part no. SKT-2BC.	V51 Grid Testpoint Figure 5-12
J53		Same as J52.	V51 Cathode Testpoint Figure 5-12
L51		COIL, RADIO FREQUENCY: 2 windings, single layer closewound; unshielded, ceramic form, powdered iron core, primary section 5 turns, secondary section 56 turns; 42498 dwg/part no. B19666.	S51 Antenna Coil Band 1 Figure 5-12
L52		COIL, RADIO FREQUENCY: 2 winding, single layer closewound; unshielded, ceramic form, powdered iron core, primary section 3 turns, secondary section 29 turns; 42498 dwg/part no. B19687.	S51 Antenna Coil Band 2 Figure 5-12
L53		COIL, RADIO FREQUENCY: 2 windings, single layer wound; unshielded, ceramic form, powdered iron core, primary section closewound 2¾ turns, secondary section spacewound 11 turns; 42498 dwg/part no. B19697.	S51 Antenna Coil Band 3 Figure 5-12
L54		COIL, RADIO FREQUENCY: 2 windings, single layer spacewound, unshielded, ceramic form powdered iron core, primary section 1 turn, secondary section 5 turns; 42498 dwg/part no. B19669.	S51 Antenna Coil Band 4 Figure 5-12
L55		CHOKE, RADIO FREQUENCY: single layer closewound, unshielded; iron form; inductance 46 uh. ±5% at 2-5 mc; 42498 dwg/part no. B19653.	Coupling between L52 and L59 Figure 5-12
L56		CHOKE, RADIO FREQUENCY: single layer closewound, unshielded; iron form; inductance 13.2 uh. ±5% at 2.5 mc; 42498 dwg/part no. B19633.	Coupling between L53 and L60 Figure 5-12
L57		CHOKE, RADIO FREQUENCY: single layer closewound, unshielded; phenolic form; inductance 6.3 uh. ±5% at 7.9 mc; 42498 dwg/part no. B19654.	Couplings between L54 and L61 Figure 5-12
L58		COIL, RADIO FREQUENCY: 2 windings, single layer closewound, unshielded; ceramic form, powdered iron core; primary section 3 turns, secondary section 59 turns; 42498 dwg/part no. B19667.	1st R.F. Band 1 Figure 5-12
L59		COIL, RADIO FREQUENCY: 2 windings, single layer closewound, unshielded; ceramic form, powdered iron core, primary section 5 turns, secondary section 26 turns; 42498 dwg/part no. B19688.	1st R.F. Band 2 Figure 5-12
L60		COIL, RADIO FREQUENCY: 2 windings, single layer spacewound, unshielded; ceramic form, powdered iron core, primary section 4 turns, secondary section 12 turns; 42498 dwg/part no. B19693.	1st R.F. Band 3 Figure 5-12
L61		COIL, RADIO FREQUENCY: 2 windings, single layer spacewound, unshielded; ceramic form, powdered iron core, primary section 1¼ turns, secondary section 4 turns; 42498 dwg/part no. B19670.	1st R.F. Band 4 Figure 5-12
L62		CHOKE, RADIO FREQUENCY: single layer closewound, unshielded, type RC20GF470J Resistor used as coil form, inductance 0-65 uh. ±10% at 25 mc; 42498 dwg/part no. B19651.	V51 Filament Figure 5-12
L63		Same as L62.	V51 Filament Figure 5-12

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R51		RESISTOR, FIXED COMPOSITION: 68 ohms ±5% ½ W; type no. RC20GF680J, 01121 type.	S51 Damping Figure 5-12
R52		RESISTOR, FIXED COMPOSITION: 330,000 ohms ±5% ½ W; type no. RC20GF334J, 01121 type.	V51 Grid Load Figure 5-12
R53		Same as R52.	V51 Grid Figure 5-12
R54		RESISTOR, FIXED COMPOSITION: 150 ohms ±5% ½ W; type no. RC20GF151J, 01121 type.	V51 Cathode Bias Figure 5-12
R55		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V51 Parasitic Suppressor Figure 5-12
R56		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	V51 Parasitic Suppressor Figure 5-12
S51		SWITCH, ROTARY: wafer, 3 pole, 6 position, shorting; 15909 dwg A4376-117 modified per 42498 dwg/part no. C18605-2.	J51 Antenna Input Figure 5-12
S52		Same as S51.	J51 Antenna Input Figure 5-12
V51		ELECTRON TUBE: R.F. pentode, miniature; type no. 5654/6AK5W, 24446 type.	1st R.F. Amplifier Figure 5-12
XV51		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	For V51 Figure 5-12
101-149		PRESELECTOR, 2ND R.F., ASSEMBLY NO. A19587.	
C101		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 1000 vdc working, 2.6 to 21.5 uuf; 89819 dwg/part no. ATM-21 locking.	L101 Trimmer Figure 5-12
C102		Same as C101.	L102 Trimmer Figure 5-12
C103		Same as C101.	L103 Trimmer Figure 5-12
C104		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 15 uuf. ±5%; type no. CC20CH150J, 91984 type.	L104 Padder Figure 5-12
C105		Same as C101.	L104 Trimmer Figure 5-12
C106		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 22 uuf. ±5%; type no. CC20CH220J, 91984 type.	V101 Padder Figure 5-12
C107		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 100 uuf. ±2%; type no. CC32CG101G, 91984 type.	V101 Grid Coupling Figure 5-12
C108		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	V101 Grid by-pass Figure 5-12
C109		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; type no. CK70A102M, 00656 type.	V101 Feedthru by-pass Figure 5-12
C110		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V101 Cathode by-pass Figure 5-12
C111		Same as C109.	V101 Heater Feedthru by-pass Figure 5-12
C112		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15404T15.	V101 Screen by-pass Figure 5-12
C113		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1500 uuf. −20 +100%; type no. CK61Y152Z, 01121 type.	V101 Heater by-pass Figure 5-12

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C114		Same as C113.	V101 Heater by-pass Figure 5-12
C115		Same as C109.	V101 Feedthru by-pass Figure 5-12
C116		Same as C109.	V101 Screen Feedthru by-pass Figure 5-12
C117		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±10% type no. CK60AW102K, 81349 type.	V101 Cathode by-pass Figure 5-12
J101		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V101 Grid Testpoint Figure 5-12
J102		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 part no. FXR95225.	2nd R.F. Amplifier Output Figure 5-12
L101		COIL, RADIO FREQUENCY: 2 windings, single layer closewound; unshielded; ceramic form, powdered iron core, primary section 6 turns, secondary section 59 turns; 42498 dwg/part no. B19668.	2nd R.F. Band 1 Figure 5-12
L102		COIL, RADIO FREQUENCY: 2 windings, single layer closewound; unshielded; ceramic form, powdered iron core; primary section 5 turns, secondary section 26 turns; 42498 dwg/part no. B19694.	2nd R.F. Band 2 Figure 5-12
L103		COIL, RADIO FREQUENCY: 2 windings, single layer wound; unshielded; ceramic form, powdered iron core; primary section closewound 5 turns, secondary section spacewound 12 turns; 42498 dwg/part no. B19691.	2nd R.F. Band 3 Figure 5-12
L104		COIL, RADIO FREQUENCY: 2 windings, single layer spacewound; unshielded; ceramic form, powdered iron core, primary section 2 turns, secondary section 4 turns; 42498 dwg/part no. B19671.	2nd R.F. Band 4 Figure 5-12
L105		CHOKE, RADIO FREQUENCY: single layer closewound, unshielded, type no. RC20GF470J Resistor used as coil form; inductance 0.65 uh. ±10% at 25 mc; 42498 dwg/part no. B19651.	V101 Heater Choke Figure 5-12
L106		Same as L105.	V101 Filament Figure 5-12
R101		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% ½ W; type no. RC20GF472J, 01121 type.	V51 Screen and Plate Dropping Figure 5-12
R102		RESISTOR, FIXED COMPOSITION: 330,000 ohms ±5% ½ W; type no. RC20GF334J, 01121 type.	V101 Grid Load Figure 5-12
R103		Same as R102.	V101 Grid Figure 5-12
R104		RESISTOR, FIXED COMPOSITION: 2.2 megohms ±5% ½ W; type no. RC20GF225J, 01121 type.	V101 Grid Figure 5-12
R105		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	V101 Cathode by-pass Figure 5-12
R106		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V101 Parasitic Suppressor Figure 5-12
R107		Same as R106.	V101 Parasitic Suppressor Figure 6-3
S101		SWITCH, ROTARY: wafer, 3 pole, 6 position, shorting; 42498 dwg/part no. C18605-1.	Preselector Band Switch Figure 5-12
V101		ELECTRON TUBE: R.F. pentode, miniature; type no. 5654/6AK5W, 24446 type.	2nd R.F. Amplifier Figure 5-12

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
XV101		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	For V101 Figure 5-12
151-199		PRESELECTOR, MIXER, ASSEMBLY NO. A19588.	
C151		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; type no. CK70A102M, 00656 type.	V101 Screen Supply by-pass Figure 5-12
C152		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 82 uuf. ±5%; type no. CM15C820J, 72136 type.	L151 Trimmer Figure 5-12
C153		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 1000 vdc working 2.6 to 21.5 uuf. 89819 dwg/part no. ATM-21 locking.	L151 Trimmer Figure 5-12
C154		Same as C153.	L152 Trimmer Figure 5-12
C155		Same as C153.	L153 Trimmer Figure 5-12
C156		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 10 uuf. ±5%; type no. CC20CH100J, 91984 type.	L154 Padder Figure 5-12
C157		Same as C153.	L154 Trimmer Figure 5-12
C158		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 22 uuf. ±5%; type no. CC20CH220J, 91984 type.	V151 Padder Figure 5-12
C159		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V151 Cathode by-pass Figure 5-12
C160		Same as C151.	V151 Feedthru by-pass Figure 5-12
C161		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1500 uuf. −20 +100%; type no. CK61Y152Z, 01121 type.	V151 Heater by-pass Figure 5-12
C162		Same as C161.	V151 Heater by-pass Figure 5-12
C163		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15404T12.	V151 Screen by-pass Figure 5-12
C164		Same as C151.	V151 Heater Feedthru by-pass Figure 5-12
C165		Same as C151.	V151 Screen Feedthru by-pass Figure 5-12
EV151		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-2.	V151 Figure 5-12
J151		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	Preselector Mixer Input Figure 5-12
J152		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V151 Grid Test Point Figure 5-12
J153		Same as J151.	Mixer Input Figure 5-12
J154		Same as J151.	Mixer Output Figure 5-12
L151		COIL, RADIO FREQUENCY: 2 windings, primary section 1 pi wound, 89 turns per pi; secondary section single layer closewound 59 turns; unshielded; ceramic form, powdered iron core; 42498 dwg/part no. B19728.	Mixer Band 1 Figure 5-12

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
L152		COIL, RADIO FREQUENCY: 2 windings, primary section 1 pi wound, 73 turns per pi; secondary section single layer closewound 26 turns; unshielded; ceramic form, powdered iron core; 42498 dwg/part no. B19730.	Mixer Band 2 Figure 5-12
L153		COIL, RADIO FREQUENCY: 2 windings, primary section 1 pi wound, 36 turns per pi; secondary section single layer spacewound, 12 turns; unshielded; ceramic form, powdered iron core; 42498 dwg/part no. B19696.	Mixer Band 3 Figure 5-12
L154		COIL, RADIO FREQUENCY: 2 windings, primary section 1 pi wound, 18 turns per pi; secondary section single layer spacewound, 4 turns; unshielded; ceramic form, powdered iron core; 42498 dwg/part no. B19675.	Mixer Band 4 Figure 5-12
L155		CHOKE, RADIO FREQUENCY: single layer closewound; unshielded; 0.65 uh. ±10% at 25 mc, RC20GF470J resistor used as coil form; 42498 dwg/part no. B19651.	V151 Heater Choke Figure 5-12
L156		Same as L155.	V151 Heater Choke Figure 5-12
R151		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% ½ W; type no. RC20GF472J, 01121 type.	V101 Plate Dropping Figure 5-12
R152		RESISTOR, FIXED COMPOSITION: 100,000 ohms ±5% ½ W; type no. RC20GF104J, 01121 type.	V151 Grid Load Figure 5-12
R153		RESISTOR, FIXED COMPOSITION: 200 ohms ±5% ½ W; type no. RC20GF201J, 01121 type.	V151 Cathode Bias Figure 5-12
R154		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% ½ W; type no. RC20GF103J, 01121 type.	V151 Screen Dropping Figure 5-12
S151-1		SWITCH SECTION, ROTARY: wafer, 3 pole, 6 position, shorting; 15909 dwg B4376-112 modified per 42498 dwg/part no. C18420-1.	V101 Figure 5-12
S151-2		SWITCH SECTION, ROTARY: wafer, 3 pole, 6 position, shorting; 15909 dwg B4376-112 modified per 42498 dwg/part no. C18420-1.	V101 Figure 5-12
V151		ELECTRON TUBE: pentagrid, converter, miniature; type no. 5750/6BE6W, 24446 type.	S151-2 Mixer 5750 Figure 5-12
XV151		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V151 Figure 5-12
201-299		HARMONIC AMPLIFIER: 2.9 to 32.9 mc in four bands; fil 6.3 vac; plate 160 vdc; c/o 3 tubes; tuning incremental in 100 kc steps; bandwidth 100 kc; 3 tuned circuits ganged together with PRESELECTOR tuned circuits and HIGH FREQUENCY OSCILLATOR tuned circuit; p/o Radio Receiving Set AN/WRR-2A.	
201-249		HARMONIC AMPLIFIER, ASSEMBLY NO. A19590.	
C201		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 390 uuf. ±5% type no. CM15C391J, 72136 type.	V201 Grid Harmonic Generator Return Figure 5-39
C202		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V201 Cathode by-pass Figure 5-39
C203		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15402T15.	V201 Screen by-pass Figure 5-39
C204		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; type no. CK70A102M, 00656 type.	V201 Screen Feedthru by-pass Figure 5-39
C205		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 0.01 uf. ±5%; type no. CM35D103J, 72136 type.	V201 Screen by-pass Figure 5-39

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C206		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 3000 uuf. ±2%; type no. CM30E302G, 72136 type.	L204 Series Padder Figure 5-39
C207		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 1600 uuf. ±2%; type no. CM20D162G, 72136 type.	L202 Series Padder Figure 5-39
C208		CAPACITOR, FIXED MICA DIELECTRIC: 600 vdc working 1100 uuf. ±2%; type no. CM20D112G, 72136 type.	L201 Series Padder Figure 5-39
C209		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 15 uuf. ±5%; type no. CC20CH150J, 91984 type.	L201 Padder Figure 5-39
C210		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 2700 uuf. ±2%; type no. CM30E272G, 72136 type.	L203 Series Padder Figure 5-39
C211		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type; 1000 vdc working 2.6 to 21.5 uuf. 89819 dwg/part no. ATM-21 locking.	L201 Trimmer Figure 5-39
C212		Same as C211.	L202 Trimmer Figure 5-39
C213		Same as C211.	L203 Trimmer Figure 5-39
C214		Same as C211.	L204 Trimmer Figure 5-39
C215		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 12 uuf. ±5%; type no. CC20CH120J, 91984 type.	L201 Padder Figure 5-39
C216		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 5 uuf. ±5%; type no. CC20CH050D, 91984 type.	L202 Padder Figure 5-39
C217		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 22 uuf. ±5%; type no. CC20CH220J, 91984 type.	L204 Padder Figure 5-39
C218		Same as C208.	L205 Series Padder Figure 5-39
C219		Same as C207.	L205 Series Padder Figure 5-39
C220		Same as C215.	L208 Padder Figure 5-39
C221		Same as C210.	L207 Series Padder Figure 5-39
C222		Same as C209.	L205 Padder Figure 5-39
C223		Same as C216.	L206 Padder Figure 5-39
C224		Same as C211.	L208 Trimmer Figure 5-39
C225		Same as C206.	L208 Series Padder Figure 5-39
C226		Same as C211.	L205 Trimmer Figure 5-39
C227		Same as C211.	L206 Trimmer Figure 5-39
C228		Same as C211.	L207 Trimmer Figure 5-39
C229		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1 uuf. ±.25 uuf. tol: type no. CC20CK010C, 91984 type.	L205 Double Tuned Circuit Coupling Figure 5-39

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C230		Same as C209.	L205 Harmonic Amplifier Padder Figure 5-39
C231		Same as C204.	V201 Heater Feedthru by-pass Figure 5-39
C232		Same as C204.	V202 Feedthru by-pass Figure 5-39
C233		Same as C202.	V202 Cathode by-pass Figure 5-39
C234		Same as C203.	V202 Screen by-pass Figure 5-39
C235		Same as C204.	V202 Feedthru by-pass Figure 5-39
C236		Same as C204.	V202 Feedthru by-pass Figure 5-39
C237		Same as C204.	V202 Screen Feedthru by-pass Figure 5-39
C238		Same as C204.	V202 Screen Feedthru by-pass Figure 5-39
C239		Same as C204.	V202 Cathode Feedthru by-pass Figure 5-39
C240		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf ±20%; 56289 dwg/part no. 118P22402T12.	V202 Heater by-pass Figure 5-39
C241		Same as C240.	Heater by-pass Figure 5-39
CR201		SEMICONDUCTOR DEVICE, DIODE: germanium; Mil-E-1D type no. 1N198, 71840 type.	V201 Harmonic Generator Figure 5-39
EV201		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	V201 Figure 5-39
EV202		Same as EV201.	V202 Figure 5-39
J201		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	P201 Harmonic Amplifier Input Figure 5-39
J202		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V201 Grid Testpoint Figure 5-39
J203		Same as J202.	V202 Grid Testpoint Figure 5-39
L201		COIL, RADIO FREQUENCY: single layer closewound; unshielded; 13.1 uh. ±5% at 2.5 mc; ceramic form powdered iron core; 42498 dwg/part no. B19736.	1st Harmonic Amplifier, Band 1 Figure 5-39
L202		COIL, RADIO FREQUENCY: single layer closewound; unshielded; 3.98 uh. ±5% at 7.9 mc; ceramic form, powdered iron core; 42498 dwg/part no. B19737.	1st Harmonic Amplifier, Band 2 Figure 5-39
L203		COIL, RADIO FREQUENCY: single layer spacewound; unshielded; 1.04 uh. ±5% at 7.9 mc; ceramic form, powdered iron core; 42498 dwg/part no. B19738.	1st Harmonic Amplifier, Band 3 Figure 5-39
L204		COIL, RADIO FREQUENCY: single layer spacewound; unshielded; .142 uh. ±2% at 25 mc; ceramic form, powdered iron core; 42498 dwg/part no. B32240.	1st Harmonic Amplifier, Band 4 Figure 5-39
L205		Same as L201.	2nd Harmonic Amplifier, Band 1 Figure 5-39

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
L206		Same as L202.	2nd Harmonic Amplifier, Band 2 Figure 5-39
L207		Same as L203.	2nd Harmonic Amplifier, Band 3 Figure 5-39
L208		COIL, RADIO FREQUENCY: single layer spacewound; unshielded; 0.21 uh. ±2% at 25 mc; ceramic form, powdered iron core; 42498 dwg/part no. B19739.	2nd Harmonic Amplifier, Band 4 Figure 5-39
R201		RESISTOR, FIXED COMPOSITION: 2200 ohms ±5% ½ W; ~~type no.~~ RC20GF222J, 01121 type.	V201 Harmonic Generator Load Figure 5-39
R202		RESISTOR, FIXED COMPOSITION: 470,000 ohms ±5% ½ W; type no. RC20GF474J, 01121 type.	V201 Grid Load Figure 5-39
R203		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V201 Cathode Bias Figure 5-39
R204		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% ½ W; type no. RC20GF472J, 01121 type.	V201 Screen Dropping Figure 5-39
R205		RESISTOR, FIXED COMPOSITION: 680,000 ohms ±5% ½ W; type no. RC20GF684J, 01121 type.	V202 Grid Load Figure 5-39
R206		RESISTOR, FIXED COMPOSITION: 4.7 ohms ±5% ½ W; type no. RC20GF4R7J, 01121 type.	L205 through L208 Damping Figure 5-39
R207		Same as R203.	V202 Cathode Parasitic Suppressor Figure 5-39
R208		Same as R203.	V202 Screen Parasitic Suppressor Figure 5-39
R209		Same as R204.	V202 Screen Dropping Figure 5-39
R210		Same as R203.	V202 Plate Parasitic Suppressor Figure 6-3
R211		RESISTOR, FIXED COMPOSITION: 470 ohms ±5% ½ W; type no. RC20GF471J, 01121 type.	V202 Cathode Bias Figure 5-39
S201		SWITCH, ROTARY: wafer, 3 pole, 6 position, shorting; 42498 dwg/part no. C18605-2.	Band Switch Figure 5-39
S202		SWITCH, ROTARY: wafer, 3 pole, 6 position, shorting; 42498 dwg/part no. C18605-1.	Band Switch Figure 5-39
V201		ELECTRONIC TUBE: R.F. pentode, miniature; type 5654/6AK5W, 24446 type.	1st Harmonic Amplifier Figure 5-39
V202		Same as V201.	2nd Harmonic Amplifier Figure 5-39
XV201		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V201 Figure 5-39
XV202		Same as XV201.	V202 Figure 5-39
251-299		HARMONIC MIXER ASSEMBLY NO. A19591.	
C251		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; type no. CK70A102M, 00656 type.	V202 Feedthru by-pass Figure 5-39
C252		CAPACITOR, FIXED MICA DIELECTRIC: 600 vdc working 1100 uuf. ±2%; type no. CM20D112G, 72136 type.	L251 Series Padder Figure 5-39
C253		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 1600 uuf. ±2%; type no. CM20D162G, 72136 type.	L252 Series Padder Figure 5-39

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C254		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 2700 uuf. ±2%; type no. CM30D272G, 72136 type.	L253 Series Padder Figure 5-39
C255		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 3000 uuf. ±2%; type no. CM30E302G, 72136 type.	L254 Series Padder Figure 5-39
C256		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 1000 vdc working 02.6 to 21.5 uuf; 89819 dwg/part no. ATM-21 locking.	L251 Trimmer Figure 5-39
C257		Same as C256.	L252 Trimmer Figure 5-39
C258		Same as C256.	L253 Trimmer Figure 5-39
C259		Same as C256.	L254 Trimmer Figure 5-39
C260		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 5 uuf. ±0.25 uuf. tol.; type no. CC20CH050C, 91984 type.	L251 Padder Figure 5-39
C261		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 2 uuf. ±0.25 uuf. tol.; type no. CC20CK020C, 91984 type.	L252 Padder Figure 5-39
C262		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 12 uuf. ±5%; type no. CC20CH120J, 91984 type.	L254 Padder Figure 5-39
C263		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 15 uuf. ±5%; type no. CC20CH150J, 91984 type.	L251 thru L254 Padder Figure 5-39
C264		Same as C251.	V251 Heater Feedthru Figure 5-39
C265		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V251 Cathode by-pass Figure 5-39
C266		Same as C251.	V251 Heater Feedthru Figure 5-39
C267		Same as C251.	V251 Screen Feedthru Figure 5-39
C268		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15404T15.	V251 Screen by-pass Figure 5-39
EV251		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-2.	V251 Figure 5-39
J251		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	V301 Harmonic Mixer Input Figure 5-39
J252		Same as J251.	Harmonic Mixer Output Figure 5-39
J253		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V251 Grid Testpoint Figure 5-39
L251		COIL, RADIO FREQUENCY: 2 windings single layer closewound; unshielded; ceramic form, powdered iron core; primary section 6 turns, secondary section 37 turns; 42498 dwg/part no. B19748.	Harmonic Mixer Band 1 Figure 5-39
L252		COIL, RADIO FREQUENCY: 2 windings single layer closewound; unshielded; ceramic form, powdered iron core; primary section 6 turns, secondary section 20 turns; 42498 dwg/part no. B19749.	Harmonic Mixer Band 2 Figure 5-39
L253		COIL, RADIO FREQUENCY: 2 windings single layer closewound; unshielded; ceramic form, powdered iron core; primary section 6 turns, secondary section 9 turns; 42498 dwg/part no. B19750.	Harmonic Mixer Band 3 Figure 5-39

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
L254		COIL, RADIO FREQUENCY: 2 windings single layer spacewound; unshielded; ceramic form, powdered iron core; primary section 1¾ turns, secondary section 3 turns; 42498 dwg/part no. B19751.	Harmonic Mixer Band 4 Figure 5-39
R251		RESISTOR, FIXED COMPOSITION: 22,000 ohms ±5% ½ W; type no. RC20GF223J, 01121 type.	S251-2 Voltage Divider Figure 5-39
R252		RESISTOR, FIXED COMPOSITION: 12,000 ohms ±5% ½ W; type no. RC20GF123J, 01121 type.	S251-2 Voltage Divider Figure 5-39
R253		RESISTOR, FIXED COMPOSITION: 6800 ohms ±5% ½ W; type no. RC20GF682J, 01121 type.	S251-2 Voltage Divider Figure 5-39
R254		RESISTOR, FIXED COMPOSITION: 4.7 ohms ±5% ½ W; type no. RC20GF4R7J, 01121 type.	L251 thru L254 Damping Figure 5-39
R255		RESISTOR, FIXED COMPOSITION: 100,000 ohms ±5% ½ W; type no. RC20GF104J, 01121 type.	V251 Injection Grid Load Figure 5-39
R256		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	V251 Cathode Bias Figure 5-39
R257		Same as R251.	V251 Screen Dropping Figure 5-39
R258		RESISTOR, FIXED, COMPOSITION: 15 ohms ±5% ½ W; type no. RC20GF150J, 81349 type.	V251 Grid Suppressor Figure 5-39
S251		SWITCH, ROTARY: 2 section, wafer, 3 pole, 6 position, shorting; 42498 dwg/part no. C18420-2.	Band Switch Figure 5-39
V251		ELECTRON TUBE: pentegrid converter; miniature type 5750/6BE6W; 24446 type.	Harmonic Mixer J252 Figure 5-39
XV251		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V251 Figure 5-39
301-349		HIGH FREQUENCY OSCILLATOR: 3.725 to 33.725 mc in four bands; fil 6.3 vac (current regulated), plate 105 vdc (voltage regulated); coil selection ganged together with that of the PRESELECTOR and HARMONIC AMPLIFIER; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A19592.	
C301		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 390 uuf. ±2%; type no. CM15D391G, 72136 type.	L301 Series Padder Figure 5-36
C302		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 680 uuf. ±2%; type no. CM20D681G, 72136 type.	L302 Series Padder Figure 5-36
C303		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 1500 uuf. ±2%; type no. CM20D152G, 72136 type.	L304 Series Padder Figure 5-36
C304		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 1200 uuf. ±2%; type no. CM20D122G, 72136 type.	L303 Series Padder Figure 5-36
C305		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 15 uuf. ±5%; type no. CC20UJ150J, 91984 type.	L301 Padder Figure 5-36
C306		Reference Designation Cancelled.	
C307		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 10 uuf. ±0.5 uuf. tol.; type no. CC20UJ100D, 91984 type.	L304 Padder Figure 5-36
C308		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type; 1000 vdc working 2 to 13 uuf. 89819 dwg/part no. ATM-12 locking.	L301 Trimmer Figure 5-36
C309		Same as C308.	L302 Trimmer Figure 5-36
C310		Same as C308.	L303 Trimmer Figure 5-36
C311		Same as C308.	L304 Trimmer Figure 5-36

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C312		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 5 uuf. ±0.5 uuf. tol.; type no. CC20CH050D, 91984 type.	V301 Output Coupling Figure 5-36
C313		Same as C312.	V301 Output Coupling Figure 5-36
C314		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 100 uuf. ±2%; type no. CC32CG101G, 91984 type.	V301 Grid Coupling Figure 5-36
C315		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; type no. CK70A102M, 00656 type.	V301 Feedthru by-pass Figure 5-36
C316		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 4700 uuf. −20 +100%; type no. CK62Y472Z, 01121 type.	V301 Plate by-pass Figure 5-36
C317		Same as C315.	V301 Plate, Feedthru by-pass Figure 5-36
EV301		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-4.	V301 Figure 5-36
J301		CONNECTOR, RECEPTACLE ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	HFO Output Figure 5-36
J302		Same as J301.	HFO Output Figure 5-36
J303		CONNECTOR, RECEPTACLE ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V301 Grid Testpoint Figure 5-36
L301		COIL, RADIO FREQUENCY: 2 windings, single layer closewound; unshielded; ceramic form, powdered iron core; primary section 5 turns, secondary section 34 turns; 42498 dwg/part no. B19642.	HFO Band 1 Figure 5-36
L302		COIL, RADIO FREQUENCY: 2 windings, single layer closewound; unshielded; ceramic form, powdered iron core; primary section 3 turns, secondary section 22 turns; 42498 dwg/part no. B19643.	HFO Band 2 Figure 5-36
L303		COIL, RADIO FREQUENCY: 2 windings, single layer closewound; unshielded; ceramic form, powdered iron core; primary section 2 turns, secondary section 12 turns; 42498 dwg/part no. B19644.	HFO Band 3 Figure 5-36
L304		COIL, RADIO FREQUENCY: 2 windings, single layer closewound; unshielded; ceramic form, powdered iron core; each section 2¾ turns; 42498 dwg/part no. B19645.	HFO Band 4 Figure 5-36
L305		CHOKE, RADIO FREQUENCY: single layer closewound; unshielded; 0.35 uh ±5% at 25 mc phenolic form; 42498 dwg/part no. B19660.	HFO Band 3 Series Inductor Figure 5-36
L306		CHOKE, RADIO FREQUENCY: single layer closewound; unshielded; 1.3 uh ±5% at 7.9 mc phenolic form; 42498 dwg/part no. B19661.	HFO Band 2 Series Inductor Figure 5-36
L307		CHOKE, RADIO FREQUENCY: single layer closewound; unshielded; 3 uh ±5% at 7.9 mc phenolic form; 42498 dwg/part no. B19662.	HFO Band 1 Series Inductor Figure 5-36
R301		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V301 Parasitic Suppressor Figure 5-36
R302		RESISTOR, FIXED COMPOSITION: 15 ohms ±5% ½ W; type no. RC20GF150J, 01121 type.	V301 Grid Parasitic Suppressor Figure 5-36
R303		RESISTOR, FIXED COMPOSITION: 15,000 ohms ±5% ½ W; type no. RC20GF153J, 01121 type.	V301 Output Divider Figure 5-36
R304		Same as R302.	V301 Grid Parasitic Suppressor Figure 5-36

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R305		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% ½ W; type no. RC20GF102J, 01121 type.	V301 Plate Filter Figure 5-36
S301		SWITCH, ROTARY: wafer, 2 sections, 6 position, shorting; 42498 dwg/part no. C18420-3.	Bandswitch Figure 5-36
V301		ELECTRON TUBE: twin triode; reliable miniature, receiving; type no. 5670, 49671 type.	High Frequency Oscillator Figure 5-36
XV301		SOCKET, ELECTRON TUBE: 9, miniature; type no. TS103C01, 91662 type.	For V301 Figure 5-36
351-399		TUNABLE IF: 1625 to 1725 kc; no tubes; bandwidth 150 kc; 4 tuned filter sections ganged together with INTERPOLATION OSCILLATOR tuned circuit; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A20382.	
C351		CAPACITOR, VARIABLE, AIR DIELECTRIC: 4 sections, plate meshing type; each section, 1400 vrms, 4.2 uuf. to 13.5 uuf. straight line capacity tuning; 42498 dwg/part no. C23897.	Filter Tuning Capacitor Figure 5-15
C352		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf ±20%; 56289 dwg/part no. 118P15404S7.	R351 Meter Multiplier By-pass Figure 5-15
C353		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 47 uuf. ±5%; type no. CM15C470J, 72136 type.	L353 Tuning Coil Series Figure 5-15
C354		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 1200 uuf. ±5%; type no. CM20C122J, 72136 type.	C353 Series Shunt Figure 5-15
C355		Same as C353.	L353 Tuning Coil Series Figure 5-15
J351		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	Tunable Filter Input Figure 5-15
J352		Same as J351.	Tunable Filter Input Figure 5-15
L351		COIL, RADIO FREQUENCY: 1 pi, duo lateral wound; 115 turns per pi; unshielded; 150 uh, ±10%; at 790 kc ceramic form, powdered iron core; 42498 dwg/part no. B28721.	1st Section Tunable, Filter, Series Tuning Coil Figure 5-15
L352		CHOKE, RADIO FREQUENCY: single layer closewound; unshielded; 5 uh ±10% at 7.9 mc phenolic form; 42498 dwg/part no. B28720.	1st Section Tunable Filter, Meter Choke Figure 5-15
L353		Same as L351.	2nd Section Tunable Filter, Series Tuning Coil Figure 5-15
L354		Same as L351.	3rd Section Tunable Filter, Series Tuning Coil Figure 5-15
L355		Same as L352.	4th Section Tunable Filter, Shunt Coil Figure 5-15
L356		Same as L351.	4th Section Tunable Filter, Series Tuning Coil Figure 5-15
R351		RESISTOR, FIXED COMPOSITION: 15,000 ohms ±5% ½ W; type no. RC20GF153J, 01121 type.	TB603-1 Meter Multiplier Figure 5-15
R352		RESISTOR, FIXED COMPOSITION: 150,000 ohms ±5% ½ W; type no. RC20GF154J, 01121 type.	L356 Tuning Coil Connects to Both Points On Coil Figure 5-15

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
401-449		INTERPOLATION OSCILLATOR: 680 to 580 kc; c/o 1 tube; fil 6.3 vac, plate 105 vdc (voltage regulated); turning ganged to TUNABLE IF. tuning; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A19841-2.	
C401		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 1000 vdc working 2.6 to 21.5 uuf.; 89819 dwg/part no. ATM-21 locking.	V401 Grid Trimmer Figure 5-42
C402		CAPACITOR, FIXED CERAMIC DIELECTRIC: 100 vdc working 100 uuf. ±1%; type no. 386-000-COZO-101F, 72982 type.	V401 Grid Padder Figure 5-42
C403		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 12 uuf. ±2%; type no. CC20HH120G, 91984 type.	V401 Grid Coupling Figure 5-42
C404		CAPACITOR, FIXED CERAMIC DIELECTRIC: 100 vdc working 56 uuf. ±1%; 72982 dwg/part no. 386-000-COZO-560F.	V401 Padder Figure 5-42
C405		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 4 uuf. 0.1 uuf. tol.; type no. NO80-315, CC20UKOR4C, 72982 type.	L401 and L402 Padder Figure 5-42
C406		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 1000 vdc working 2 to 13 uuf.; 89819 dwg/part no. ATM-12 locking.	L401 and L402 Trimmer Figure 5-42
C407		Reference Designation Cancelled.	
C408		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working .01 uf. ±5%; type no. CM35D103J, 72136 type.	V401 Plate by-pass Figure 5-42
C409		CAPACITOR, FIXED PAPER DIELECTRIC: 600 vdc working .01 uf. ±5%; type no. CZ24BKF103, 81831 type.	V401 Plate Feedthru by-pass Figure 5-42
C410		Same as C403.	V401 Output Voltage Divider Figure 5-42
C411		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 2200 uuf. ±5%; type no. CM30D222J, 72136 type.	V401 Output Voltage Divider Figure 5-42
C412		CAPACITOR, FIXED PAPER DIELECTRIC: 100 vdc working 0.1 uf. ±20%; type no. CZ24BKB104, 81831 type.	V401 Filament Feedthru by-pass Figure 5-42
C413		Same as C403.	V401 Output Voltage Divider Figure 5-42
C414		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	V401 Output Voltage Divider Figure 5-42
C415		Same as C412.	V401 Filament Feedthru by-pass Figure 5-42
EV401		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	V401 Interpolation Oscillator Figure 5-42
J401		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	Interpolation Oscillator Output Figure 5-42
J402		Same as J401.	Interpolation Oscillator Output Figure 5-42
L401		COIL, RADIO FREQUENCY: 2 windings, layer wound, unshielded; primary section 128 turns secondary section 18 turns, ceramic form, air core; 42498 dwg/part no. B19584-2.	V401 Interpolation Oscillator Figure 5-42
L402		COIL, RADIO FREQUENCY: single layer wound; unshielded; 18.8 uh ±5% at 2.5 mc. ceramic form, powdered iron core; 42498 dwg/part no. B19146.	V401 Interpolation Oscillator Tuning Figure 5-42
R401		RESISTOR, FIXED COMPOSITION: 22 ohms ±5% ½ W; type no RC20GF220J, 01121 type.	V401 Grid Suppressor Figure 5-42
R402		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V401 Cathode Figure 5-42

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R403		RESISTOR, FIXED COMPOSITION: 270,000 ohms ±5% ½ W; type no. RC20GF274J, 01121 type.	V401 Grid Shunt Figure 5-42
R404		RESISTOR, FIXED COMBINATION: 3300 ohms ±5% ½ W; type no. RC20GF332J, 01121 type.	V401 Plate Dropping Filter Figure 5-42
R405		RESISTOR, FIXED COMPOSITION: 1 megohm ±5% ½ W; type no. RC20GF105J, 01121 type.	V401 Grid Output Divider Figure 5-42
R406		Same as R405.	V401 Grid Output Divider Figure 5-42
V401		ELECTRON TUBE: pentode, miniature; type no. 5654/6AK5W, 24446 type.	Interpolation Oscillator Figure 5-42
XV401		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	For V401 Figure 5-42
451-499		FREQUENCY DIVIDER: 100 kc input, 20 kc output; fil 6.3 vac, plate 160 vdc; c/o 3 tubes; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A20274.	
C451		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 51 uuf. ±5%; type no. CM15C510J, 72136 type.	V451 Grid Coupling Figure 5-58
C452		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working .33 uf. ±20%; 56289 dwg/part no. 118P33404T15.	V451 Screen by-pass Figure 5-58
C453		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 470 uuf. ±5%; type no. CM15C471J, 72136 type.	L451 Tuning Padder Figure 5-58
C454		Same as C452.	V451 Grid Plate by-pass Figure 5-58
C455		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; type no. CK70A102M, 00656 type.	V451 Grid Feedthru by-pass Figure 5-58
C456		Same as C452.	V452 Plate Supply by-pass Figure 5-58
C457		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 100 uuf. ±5%; type no. CM15C101J, 81349 type.	V452 Grid Coupling Figure 5-58
C458		Same as C452.	V453 Plate by-pass Figure 5-58
C459		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	V453 Grid Coupling Figure 5-58
C460		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 82 uuf. ±5%; type no. CM15C820J, 72136 type.	L452 Tuning Coil Padder Figure 5-58
C461		CAPACITOR, VARIABLE CERAMIC DIELECTRIC: 500 vdc working 7 to 45 uuf. ±2%; type no. CV11D450, 72982 type.	L452 Tuning Coil Trimmer Figure 5-58
C462		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 330 uuf. ±5%; type no. CM15C331J, 72136 type.	V453 Output Divider Figure 5-58
C463		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 2000 uuf. ±5%; type no. CM30D202J, 72136 type.	L452 Output Divider Figure 5-58
C464		Same as C455.	Frequency Divider Feedthru by-pass Figure 5-58
C465		Same as C455.	Frequency Divider Feedthru by-pass Figure 5-58
EV451		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	V451 Figure 5-58
EV452		Same as EV451.	V452 Figure 5-58

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
EV453		Same as EV451.	V453 Figure 5-58
J451		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	Frequency Divider Input Figure 5-58
J452		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V451 Grid Test Point Figure 5-58
J453		Same as J452.	V452 Grid Test Figure 5-58
J454		Same as J452.	V453 Grid Test Figure 5-58
J455		Same as J451.	V453 Grid 20 KC Output Figure 5-58
L451		COIL, RADIO FREQUENCY: 1 pi, duo lateral wound; 800 turns per pi; unshielded; 5 mh. ±10% at 250 kc; ceramic form, powdered iron core; 42498 dwg/part no. B28777.	V451 Plate Tuning Figure 5-58
L452		REACTOR: 120 mh. 1500 vrms test v; HS metal closed case; type TF4RX20YY, 42498 dwg/part no. B29272.	V453 Grid Tuning Figure 5-58
R451		RESISTOR, FIXED COMPOSITION: 2200 ohms ±5% ½ W; type no. RC20GF222J, 01121 type.	V451 Grid Load Figure 5-58
R452		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% ½ W; type no. RC20GF473J, 01121 type.	V451 Grid Screen Dropping Figure 5-58
R453		RESISTOR, FIXED COMPOSITION: 27,000 ohms ±5% ½ W; type no. RC20GF273J, 01121 type.	L451 Tuning Coil Shunt Figure 5-58
R454		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% ½ W; type no. RC20GF102J, 01121 type.	V451 Grid Decoupling Figure 5-58
R455		RESISTOR, FIXED COMPOSITION: 270 ohms ±5% ½W; type no. RC20GF271J, 01121 type.	V452 Plate Parasitic Suppressor Figure 5-58
R456		RESISTOR, FIXED COMPOSITION: 470,000 ohms ±5% ½ W; type no. RC20GF474J, 01121 type.	V452 Grid Divider Figure 5-58
R457		Same as R456.	V452 Grid Divider Figure 5-58
R458		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% ½ W; type no. RC20GF472J, 01121 type.	V452 Plate Dropping Figure 5-58
R459		RESISTOR, FIXED COMPOSITION: 39,000 ohms ±5% ½ W; type no. RC20GF393J, 01121 type.	V452 Plate Load Figure 5-58
R460		Same as R451.	V452 and V453 Cathode Figure 5-58
R461		RESISTOR, FIXED COMPOSITION: 68,000 ohms ±5% ½ W; type no. RC20GF683J, 01121 type.	L452 Tuning Coil Shunt Figure 5-58
R462		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% ½ W; type no. RC20GF103J, 01121 type.	V453 Grid Figure 5-58
R463		RESISTOR, FIXED COMPOSITION: 220,000 ohms ±5% ½ W; type no. RC20GF224J, 01121 type.	V453 Grid Isolating Figure 5-58
R464		Same as R462.	
V451		ELECTRON TUBE: pentode, miniature; type no 5654/6AK5W, 24446 type.	100 KC Buffer Amplifier Figure 5-58
V452		Same as V451.	100-20 KC Divider Multivibrator Figure 5-58

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
V453		Same as V451.	100-20 KC Divider Multivibrator Figure 5-58
XV451		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V451 Figure 5-58
XV452		Same as XV451.	V452 Figure 5-58
XV453		Same as XV451.	V453 Figure 5-58
501-599		INJECTION IF: c/o 1625 to 1725 kc if. amplifier, 2 tubes, bandwidth 100 kc; 220 kc if. 1 tube, bandwidth 12 kc, 825 kc injection amplifier, 3 tubes, bandwidth 30 kc, 1405 to 1505 kc injection amplifier, 1 tube, bandwidth 100 kc, 140 kc injection amplifier, 1 tube, bandwidth 1.6 kc, fil 6.3 vac, plate 160 vdc; p/o Radio Receiving Set AN/WRR-2A, ASSEMBLY NO. A20376.	
C501		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15402T12.	V501 Cathode by-pass Figure 5-22
C502		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15404T12.	V501 Screen by-pass Figure 5-22
C503		CAPACITOR, VARIABLE CERAMIC DIELECTRIC: 500 vdc working 7.0 to 45.0 uuf. ±2%; type no. CV11D450, 72982 type.	V502 Plate Filter Input Trimmer Figure 5-22
C504		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15404T15.	V502 Screen by-pass Figure 5-22
C505		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V502 Cathode by-pass Figure 5-22
C506		Same as C503.	FL502 Filter Output Trimmer Figure 5-22
C507		Same as C503.	FL503 Filter Output Trimmer Figure 5-22
C508		Same as C504.	V503 Screen by-pass Figure 5-22
C509		Same as C501.	V503 Cathode by-pass Figure 5-22
C510		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.047 uf. ±20%; 56289 dwg/part no. 118P47304T15.	T501 B+ by-pass Figure 5-22
C511		Same as C502.	V504 Screen by-pass Figure 5-22
C512		Same as C503.	V504 Plate Trimmer Figure 5-22
C513		CAPACITOR, FIXED METALIZED PAPER DIELECTRIC: 200 vdc working 0.01 uf. ±20%; 00656 dwg/part no. P123ZNP-200V103M.	V505 Grid by-pass Figure 5-22
C514		Same as C503.	V505 Grid Output Trimmer Figure 5-22
C515		Same as C505.	V505 Cathode by-pass Figure 5-22
C516		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 51 uuf. ±5%; type no. CM15C510J, 72136 type.	V505 Grid Coupling Figure 5-22
C517		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. +80 −20%; type no. CK70A102X, 00656 type.	V505 Cathode Feedthru Figure 5-22
C518		Same as C504.	V505 Screen by-pass Figure 5-22

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C519		Same as C513.	T503 AGC Filter Figure 5-22
C520		Same as C503.	V506 Plate Filter Input Trimmer Figure 5-22
C521		Same as C504.	V506 Screen by-pass Figure 5-22
C522		Same as C505.	V506 Cathode by-pass Figure 5-22
C523		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	T503 Coupling Figure 5-22
C524		Same as C503.	V507 Grid Trimmer Figure 5-22
C525		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 110 uuf. ±5%; type no. CM15C111J, 72136 type.	T503 Grid by-pass Figure 5-22
C526		Same as C505.	V507 Cathode by-pass Figure 5-22
C527		Same as C504.	V507 Screen by-pass Figure 5-22
C528		Same as C502.	V508 B+ by-pass Figure 5-22
C529		Same as C505.	V508 Grid AGC Filter Figure 5-22
C530		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22404T15.	V508 Screen by-pass Figure 5-22
C531		Same as C505.	V508 Cathode by-pass Figure 5-22
C532		Same as C517.	V508 Cathode Feedthru Figure 5-22
C533		Same as C517.	V508 Grid Feedthru Figure 5-22
C534		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 33 uuf. ±5%; type no. CM15C330J, 72136 type.	V508 Plate Coupling Figure 5-22
C535		Same as C503.	FL503 Filter Input Trimmer Figure 5-22
C536		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 1000 uuf. ±5%; type no. CM20C102J, 72136 type.	FL503 Input Coupling Figure 5-22
C537		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 150 uuf. ±5%; type no. CM15C151J, 72136 type.	FL503 Shunt Padder Figure 5-22
C538		CAPACITOR, FIXED PAPER DIELECTRIC: 100 vdc working 0.1 uf. ±5%; type no. CZ24BKB104, 81831 type.	V508 Feedthru Figure 5-22
C539		Same as C538.	V508 Feedthru Figure 5-22
CR501		SEMICONDUCTOR DEVICE, DIODE: silicon; 80131 type no. 1N458.	T503 AGC Rectifier Figure 5-22
CR502		Same as CR501.	FL503 AGC Rectifier Figure 5-22
EV501		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	For V501 Figure 5-22
EV502		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-2.	For V502 Figure 5-22

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
EV503		Same as EV502.	For V503 Figure 5-22
EV504		Same as EV501.	For V504 Figure 5-22
EV505		Same as EV501.	For V505 Figure 5-22
EV506		Same as EV502.	For V506 Figure 5-22
EV507		Same as EV501.	For V507 Figure 5-22
EV508		Same as EV501.	For V508 Figure 5-22
FL501		Reference Designation Cancelled.	
FL502		FILTER, BAND PASS: 213.5 to 226.5 kc bandwidth at 1 db attenuation, 47,000 ohms input, 1 megohm output, HS metal case; 42498 dwg/part no. B19491.	220 KC IF Figure 5-22
FL503		FILTER, BAND PASS: 138 to 142 kc bandwidth at 3 db attenuation, 47,000 ohms input, 1 megohm output, HS metal case; 42498 dwg/part no. B29246.	140 KC Figure 5-22
FL504		FILTER, BAND PASS: 810 to 840 kc bandwidth at 6 db attenuation, 47,000 ohms input, 1 megohm output, HS metal case; 42498 dwg/part no. B19489.	825 KC Figure 5-22
FL505		FILTER, BAND PASS: 1390 to 1520 kc bandwidth at 6 db attenuation, 47,000 ohms input, 1 megohm output, HS metal case; 42498 dwg/part no. B29227.	1455 KC Figure 5-22
J501		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	J352 Tunable Filter 1625-1725 KC Input Figure 5-22
J502		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V501 Grid Test Point Figure 5-22
J503		Same as J502.	V502 Grid Test Point Figure 5-22
J504		Same as J502.	V502 Grid Test Point Figure 5-22
J505		Same as J502.	V503 Grid Test Point Figure 5-22
J506		Same as J502.	V503 Grid Test Point Figure 5-22
J507		Same as J501.	Mixer 80 KC Output Figure 5-22
J508		Reference Designation Cancelled.	
J509		Same as J501.	J401 Interpolation Oscillator Input Figure 5-22
J510		Same as J502.	V507 Grid Test Figure 5-22
J511		Same as J501.	J815 Synthesizer 140 KC Input Figure 5-22
J512		Same as J502.	V506 Grid Test Point Figure 5-22
R501		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% ½ W; type no. RC20GF472J, 01121 type.	V501 Cathode by-pass Figure 5-22

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R502		RESISTOR, FIXED COMPOSITION: 12,000 ohms ±5% ½ W; type no. RC20GF123J, 01121 type.	V501 Screen B+ Dropping Figure 5-22
R503		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V502 Grid Parasitic Suppressor Figure 5-22
R504		RESISTOR, FIXED COMPOSITION: 200 ohms ±5% ½ W; type no. RC20GF201J, 81349 type.	V502 Cathode by-pass Figure 5-22
R505		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% ½ W; type no. RC20GF473J, 01121 type.	V502 Plate Load Figure 5-22
R506		RESISTOR, FIXED COMPOSITION: 15,000 ohms ±5% ½ W; type no. RC20GF153J, 01121 type.	V502 Screen B+ Voltage Divider Figure 5-22
R507		Same as R503.	V503 Grid Parasitic Suppressor Figure 5-22
R508		Same as R504.	V503 Cathode by-pass Figure 5-22
R509		Same as R506.	V503 Screen Limiting and Recoupling Figure 5-22
R510		Same as R506.	V501 B+ Dropping Figure 5-22
R511	1	RESISTOR, FIXED COMPOSITION: 1000 to 4700 ohms ±5% ½ W; type no. RC20GF........, 01121 type.	T501 Grid Return Figure 5-22
R512		Same as R505.	V504 Plate Load Figure 5-22
R513		RESISTOR, FIXED COMPOSITION: 100,000 ohms ±5% ½ W; type no. RC20GF104J, 01121 type.	V504 Screen B+ Voltage Divider Figure 5-22
R514		RESISTOR, FIXED COMPOSITION: 470,000 ohms ±5% ½ W; type no. RC20GF474J, 01121 type.	FL504 B+ Voltage Divider Figure 5-22
R515		RESISTOR, FIXED COMPOSITION: 270 ohms ±5% ½ W; type no. RC20GF271J, 01121 type.	V505 Cathode by-pass Figure 5-22
R516		Same as R514.	V505 Grid Resistor Figure 5-22
R517		RESISTOR, FIXED COMPOSITION: 2700 ohms ±5% ½ W; type no. RC20GF272J, 01121 type.	V505 Cathode Meter Multiplier Figure 5-22
R518		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% ½ W; type no. RC20GF103J, 01121 type.	V505 Screen B+ Dropping Figure 5-22
R519		Same as R514.	V505 Screen Isolation Figure 5-22
R520		RESISTOR, FIXED COMPOSITION: 68,000 ohms ±5% ½ W; type no. RC20GF683J, 01121 type.	V506 Grid Return Figure 5-22
R521		Same as R504.	V506 Cathode by-pass Figure 5-22
R522		RESISTOR, FIXED COMPOSITION: 1 megohm ±5% ½ W; type no. RC20GF105J, 01121 type.	V505 AGC Filter Figure 5-22
R523		Same as R505.	FL505 Plate Load Figure 5-22
R524		RESISTOR, FIXED COMPOSITION: 22,000 ohms ±5% ½ W; type no. RC20GF223J, 01121 type.	FL505 B+ Dropping Figure 5-22
R525		Same as R514.	V505 AGC Load Figure 5-22

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R526		Same as R513.	V502 Grid Filter Figure 5-22
R527		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% ½ W; type no. RC20GF102J, 01121 type.	V507 Cathode Figure 5-22
R528		Same as R518.	V507 Plate Load Figure 5-22
R529		Same as R506.	V507 Screen B+ Dropping Figure 5-22
R530		Same as R514.	V508 Grid Figure 5-22
R531		RESISTOR, FIXED COMPOSITION: 47 ohms ±5% ½ W; type no. RC20GF470J, 01121 type.	V508 Cathode by-pass Figure 5-22
R532		RESISTOR, FIXED COMPOSITION: 680 ohms ±5% 2 W; type no. RC42GF681J, 01121 type.	V508 Grid B+ Dropping Figure 5-22
R533		Same as R506.	V508 Grid Screen Dropping Figure 5-22
R534		Same as R527.	V508 Cathode Meter Multiplier Figure 5-22
R535		RESISTOR, FIXED COMPOSITION: 22,000 ohms ±5% 1 W; type no. RC32GF223J, 01121 type.	V508 Plate Load Figure 5-22
R536		Same as R522.	V508 AGC Filter Figure 5-22
R537		Same as R522.	V508 AGC Load Figure 5-22
R538		Same as R513.	AGC Isolating Figure 5-22
R539		Same as R501.	V504 Cathode Resistor Figure 5-22
T501		TRANSFORMER, INTERMEDIATE FREQUENCY: resonant frequency 825 kc; shielded; adj. iron core, incl. one capacitor 33 uuf. ±10%; 42498 dwg/part no. C19336-2.	V504 Input Figure 5-22
T502		TRANSFORMER, INTERMEDIATE FREQUENCY: resonant frequency 825 kc; shielded; adj. iron core; 42498 dwg/part no. C19336-1.	855 KC Interstage Figure 5-22
T503		TRANSFORMER, INTERMEDIATE FREQUENCY: resonant frequency 1455 kc; shielded; adj. iron core, incl. capacitor, 110 uuf. ±10%; 42498 dwg/part no. C19336-3.	1455 KC Output Figure 5-22
V501		ELECTRON TUBE: pentode, miniature; type no. 5654/6AK5W, 24446 type.	Injection IF Amplifier Figure 5-22
V502		ELECTRON TUBE: pentagrid converter, miniature; type no. 5750/6BE6W, 24446 type.	Injection IF Figure 5-22
V503		Same as V502.	80 KC Mixer Figure 5-22
V504		Same as V501.	825 KC IF Amplifier Figure 5-22
V505		Same as V501.	825 KC IF Amplifier Figure 5-22
V506		Same as V502.	1455 KC Mixer Figure 5-22
V507		Same as V501.	1455 KC IF Amplifier Figure 5-22

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
V508		Same as V501.	140 KC IF Amplifier Figure 5-22
XV501		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	For V501 Figure 5-22
XV502		Same as XV501.	V502 Figure 5-22
XV503		Same as XV501.	For V503 Figure 5-22
XV504		Same as XV501.	For V504 Figure 5-22
XV505		Same as XV501.	For V505 Figure 5-22
XV506		Same as XV501.	For V506 Figure 5-22
XV507		Same as XV501.	For V507 Figure 5-22
XV508		Same as XV501.	For V508 Figure 5-22
Z501		FILTER, BAND PASS: 1625 to 1725 kc bandwidth at 1 db attenuation, metal cased; 42498 dwg/part no. C29977.	V501 IF Amplifier Figure 5-22
601-649		CONVERTER UNIT PANEL/CHASSIS: c/o front panel controls, meters, switches and tuning indicators; terminal boards; chassis brackets for mounting subassemblies p/o Radio Receiving Set. AN/WRR-2A; Assembly No's. A20197-2 and A20212-2.	
C601		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 4 section, each section 10 uuf. to 240 uuf. 1000 vrms; 42498 dwg/part no. D32271.	L51 through L54 Tuning Capacitor Figure 6-2
C601A		1st section of C601.	L51 through L54 Tuning
C601B		2nd section of C601.	L58 through L61 Tuning
C601C		3rd section of C601.	L101 through L104 Tuning
C601D		4th section of C601.	L151 through L154 Tuning
C602		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 4 section, 1000 vrms each section; 1st section 16 uuf. to 303 uuf., sections 2, 3, 4, 10 uuf. to 240 uuf.; 42498 dwg/part no. D32272.	Figure 6-2
C602A		1st section of C602.	L201 through L204 Tuning
C602B		2nd section of C602.	L205 through L208 Tuning
C602C		3rd section of C602.	L251 through L254 Tuning
C602D		4th section of C602.	HF Oscillator Tuning
C603		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 10,000 uuf. −20 +100%, type no. CK63T103Z, 82376 type.	Filament Filter Converter Front Panel
C604		Same as C603.	Filament Filter Converter Front Panel
C605		Reference Designation Cancelled.	
C606		Reference Designation Cancelled.	
C607		Reference Designation Cancelled.	
C608		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 14.9 to 67.4 uuf., 1000 vrms; 42498 dwg/part no. C32270.	Interpolator Oscillator Tuning Figure 6-2

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
DS601		LAMP, INCANDESCENT: midget flange base, 6 v 0.20 amp bulb T-1¾, clear white; JAN type no. AN3140-328, 88044 type.	Megacycle Counter Illumination Converter Front Panel
DS602		Same as DS601.	Kilocycle Counter Illumination Converter Front Panel
DS603		Same as DS601.	Megacycle Counter Illumination Converter Front Panel
DS604		Same as DS601.	Kilocycle Counter Illumination Converter Front Panel
F601		FUSE, CARTRIDGE: 2 amp, 125 v; Mil-F-15160C type no. F02D2-R00B, 98997 type.	Primary Power Protection Converter Front Panel
J602		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	S603 Converter Front Panel
J603		Same as J602.	S603 Converter Front Panel
J604		Same as J602.	S603 Converter Front Panel
L601		CHOKE, RADIO FREQUENCY: single layer wound, unshielded; 3.1 uh ±10% at 29 mc; powdered iron core; 42498 dwg/part no. B29679.	Filament Filter Converter Front Panel
L602		Same as L601.	Filament Filter Converter Front Panel
L603		Same as L601.	Filament Filter Converter Front Panel
L604		Same as L601.	Filament Filter Converter Front Panel
M601		METER, ARBITRARY SCALE: range 0-500 ma dc, 500 ohms resistance; ±5% accuracy; 42498 part no. B18774-2.	Resonance Converter Front Panel
M602		METER, ARBITRARY SCALE: range 0-100 μa, dc, 2500 ohms resistance; ±5% accuracy; 42498 part no. B18774-1.	Phase Temperature Converter Front Panel
M603		Same as M601.	.5 KC Tuning Converter Front Panel
M604		Same as M601.	100 KC Tuning Converter Front Panel
P601		CONNECTOR, PLUG ELECTRICAL: 12 contacts; 42498 dwg/part no. B31001.	Power Plug Figure 6-5
R601		Reference Designation Cancelled.	
R602		Reference Designation Cancelled.	
R603		RESISTOR, FIXED COMPOSITION: 2.7 ohms ±5% 1 W; type no. RC32GF2R7J, 01121 type.	Lamp Dropping Converter Front Panel
R604		Same as R603.	Lamp Dropping Converter Front Panel
R605		RESISTOR, FIXED COMPOSITION: 220,000 ohms ±5% ½ W; type no. RC20GF224J, 01121 type.	RF Gain Converter Front Panel
R606		RESISTOR, FIXED COMPOSITION: 180,000 ohms ±5% ½ W; type no. RC20GF184J, 01121 type.	RF Gain Converter Front Panel
R607		RESISTOR, VARIABLE: 10,000 ohms 20 ±20% dual section; 2 W per sect. linear B taper; 01121 dwg/part no. JJ63301.	RF Gain Control Converter Front Panel
R608		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% ½ W; type no. RC20GF102J, 01121 type.	Voltage Dropping Converter Front Panel

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R609		Same as R608.	Voltage Dropping Converter Front Panel
S601		Reference Designation Cancelled.	
S602		SWITCH TOGGLE: double pole, double throw; 1 position momentary; type no. ST52R, 75382 type.	Connector Panel and Chassis Converter Front Panel
S603		SWITCH, ROTARY: 3 pole, 2 position; 81716 dwg/part no. 222586-A1.	.5 KC/Cont Tuning Switch Converter Front Panel
W601		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o UG-88G/U connectors (P953, P1805); 42498 dwg/part no. B31409-1.	Interconnecting Coax Cable Figure 6-6
W602		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 2 UG-88C/U connectors (P954, P1806); 42498 dwg/part no. B31409-2.	Interconnecting Coax Cable Figure 6-6
W603		Reference Designation Cancelled.	
W603-1		CABLE ASSEMBLY, POWER, ELECTRICAL: c/o 1 AN3106A-16S-5P connector (P1807) on one end and 1 AN3106A-16S-5S connector (P956) on the other; 42498 dwg/part no. C31410-3.	Interconnecting Cable Figure 6-6
W604		CABLE ASSEMBLY, POWER, ELECTRICAL: c/o 1 AN3106A-14S-7P connector (P1804) on one end and 1 AN3106A-14S-7S connector (P958) on the other; 42498 dwg/part no. C31410-4.	Interconnecting Cable Figure 6-6
W605		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohm impedance; c/o connector, 42498 dwg/part no. A18403, (P2802) and P601; 42498 dwg/part no. C31374-1.	Interconnecting Coax Cable Figure 6-3
W606		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 2 connectors 42498 dwg/part no. A18403, (P2801 and P51); 42498 dwg/part no. C31375-1.	Interconnecting Coax Cable Figure 6-3
W607		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 2 connectors 42498 dwg/part no. A18403, (P102 and P151); 42498 dwg/part no. C31375-2.	Interconnecting Coax Cable Figure 6-2
W608		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 2 connectors 42498 dwg/part no. A18403 (P153 and P302); 42498 dwg/part no. C31375-3.	Interconnecting Coax Cable Figure 6-3
W609		CABLE ASSEMBLY, RADIO FREQUENCY: RG-59B/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A31718 (P351) on one end and 1 connector 42498 dwg/part no. A31719 (P154) on the other; 42498 dwg/part no. B31722-1.	Interconnecting Coax Cable Figure 6-2
W610		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 2 connectors 42498 dwg/part no. A18403 (P251 and P301) 42498 dwg/part no. C31375-5.	Interconnecting Coax Cable Figure 6-2
W611		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A18403 (P252) on one end, the other end is bare; 42498 dwg/part no. C31374-2.	Interconnecting Coax Cable Figure 6-2
W612		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A18403 (P509) on one end and 1 connector (P401) on the other; 42498 dwg/part no. C31375-6.	Interconnecting Coax Cable Figure 6-2

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
W613		CABLE ASSEMBLY, RADIO FREQUENCY: RG-188C/U, coaxial, 50 ohms impedance; c/o 2 connectors 42498 type no. A29628 connectors (P402 and P604); 42498 dwg/part no. B38265-3.	Interconnecting Coax Cable Figure 6-2
W614		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 2 connectors 42498 dwg/part no. A18403 (P352 and P501); 42498 dwg/part no. C31375-8.	Interconnecting Coax Cable Figure 6-2
W615		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A18403 (P451) on one end and 1 74868 type no. 48175 connector (P705) on the other; 42498 dwg/part no. C31375-9.	Interconnecting Coax Cable Figure 6-2
W616		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A18403 (P801) on one end and 1 74868 type no. 48175 connector (P455) on the other; 42498 dwg/part no. C31375-10.	Interconnecting Coax Cable Figure 6-2
W617		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A18403 (P511) on one end and 1 74868 type no. 48175 connector (P815) on the other; 42498 dwg/part no. C31375-11.	Interconnecting Coax Cable Figure 6-2
W618		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A18403 (P507) on one end and P601 on the other; 42498 dwg/part no. C31374-3.	Interconnecting Coax Cable Figure 6-2
W619		CABLE ASSEMBLY, RADIO FREQUENCY: RG-188C/U, coaxial, 50 ohms impedance; c/o 2 42498 type no. A29733 connectors (P811) on one end and P603 on the other; 42498 dwg/part no. B38265-1.	Interconnecting Coax Cable Figure 6-4
W620		CABLE ASSEMBLY, RADIO FREQUENCY: RG-188C/U, coaxial, 50 ohms impedance; c/o 2 42498 type no. A29733 connectors (P805) on one end and P602 on the other; 42498 dwg/part no. C38265-2.	Interconnecting Coax Cable Figure 6-4
W621		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 74868 type no. 48175 connector (P709) on one end and P601 on the other; 42498 dwg/part no. C31374-6.	Interconnecting Coax Cable Figure 6-4
W622		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A18403 (P201) on one end and 1 74868 type no. 48175 connector (P707) on the other; 42498 dwg/part no. end and 1 74868 type no. 48175 connector (P707) on the other; 42498 dwg/part no. C31375-12.	Interconnecting Coax Cable Figure 6-2
W623		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U, coaxial, 50 ohms impedance; c/o 1 connector 42498 dwg/part no. A18403 (P804) on one end and P601 on the other; 42498 dwg/part no. C31374-7.	Interconnecting Coax Cable Figure 6-4
W624		CABLE ASSEMBLY SET, ELECTRICAL: c/o 2 42498 dwg/part no. B31414 cables w/common connectors, 42498 dwg/part nos C18567-1 and C18567-2; 42498 dwg/part no. D19968.	Maintenance Patch Cable
XF601		FUSEHOLDER: cartridge, plastic; Mil-F-19207; 75915 dwg/part no. 349250.	Primary Power Protection Converter Front Panel
XDS601		LIGHT, PANEL: single terminal, sub-miniature, c/o 1 midget flange base T-1¾ lamp; 750 v, 0.2 amp, 150 W; 72619 type no. TT61-B7.	Megacycle Counter Illumination Front Converter Front Panel

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
XDS602		Same as XDS601.	Kilocycle Counter Illumination Front Converter Front Panel
XDS603		Same as XDS601.	Megacycle Counter Illumination Rear Converter Front Panel
XDS604		Same as XDS601.	Kilocycle Counter Illumination Rear Converter Front Panel
651-699		This series of reference designations is used in intermediate frequency-audio frequency amplifier AM-2477A/URR.	See Page 7-44
701-799		CRYSTAL OSCILLATOR: c/o crystal oven and oven oscillator-amplifier, approximately 2 kc, 3 tubes, crystal oscillator-amplifier, 1 mc, 3 tubes, crystal oscillator frequency divider, 1 mc to 100 kc, 3 tubes, fil 6.3 vac, plate 180 v, 160 v, 105 v (voltage regulated), dc; oven temperature proportionally controlled; crystal oscillator frequency stability 1 part in 10^7; p/o Radio Receiving Set AN/WRR-2A; Assembly No. A19966-2.	
A701		OVEN, CRYSTAL: 25 vac, 2 kc single phase; crystal 1 mc, 42498 dwg/part no. D29553-2.	Frequency Control Figure 5-55
C701		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15402T15.	V701 Heater by-pass Figure 5-55
C702		Same as C701.	V701 Heater by-pass Figure 5-55
C703		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 0.01 uf. ±5%; type no. CM35D103J, 72136 type.	V701 Tuning Padder Figure 5-55
C704		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.01 uf. ±20%; 56289 dwg/part no. 118P15404T15.	V701 Screen by-pass Figure 5-55
C705		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	V702 Grid Coupling Figure 5-55
C706		Same as C704.	V702 Plate Supply by-pass Figure 5-55
C707		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V702 Cathode by-pass Figure 5-55
C708		Same as C703.	V703 Grid Coupling Figure 5-55
C709		CAPACITOR, FIXED PAPER DIELECTRIC: 100 vdc working 0.1 uf. ±5%; type no. CZ24BKB104, 81831 type.	Crystal Oscillator Filament Supply Feedthru by-pass Figure 5-55
C710		Same as C709.	Crystal Oscillator Filament Supply Feedthru by-pass Figure 5-55
C711		CAPACITOR, FIXED, METALIZED PAPER DIELECTRIC: 400 vdc working .015 uf. ±20%; 00656 dwg/part no. P122ZNP400-V153M.	V703 Plate Coupling Figure 5-55
C712		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.1 uf. ±5%; type no. CZ24BKE104, 81831 type.	V703 Screen Supply Feedthru by-pass Figure 5-55
C713		Reference Designation Cancelled.	
C714		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; 01121 dwg/part no. FB2B-102W.	CR701 Feedthru by-pass Figure 5-55
C715		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 3900 uuf. ±2%; type no. CM35D392G, 72136 type.	A701 Voltage Divider Figure 5-55

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C716	2	CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1 to 47 uuf ±2%; type no. CC30 . . . . . , 91984 type.	V704 Plate Shunt Padder Figure 5-55
C717		Same as C704.	V704 AGC by-pass Figure 5-55
C718		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 22 uuf. ±2%; type no. CC20CA220J, 91984 type.	V704 Series Padder Figure 5-55
C719		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 5 to 50 uuf. straight line capacity tuning 42498 dwg/part no. D18826.	V704 Series Trimmer Figure 5-55
C720		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.1 uf. ±5%; type no. CZ24BKC104, 81831 type.	Crystal AGC Feedthru by-pass Figure 5-55
C721		Same as C704.	V704 Screen by-pass Figure 5-55
C722		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 120 uuf. ±5%; type no. CM15C121J, 72136 type.	V705 Grid Coupling Figure 5-55
C723		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 100 uuf. ±5%; type no. CM15C101J, 72136 type.	V705 Plate Coupling Figure 5-55
C724		Same as C704.	V705 Screen by-pass Figure 5-55
C725		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 10 uuf. ±5%; type no. CM15C100J, 72136 type.	V706 Grid Coupling Figure 5-55
C726		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 1000 uuf. ±5%; type no. CM20C102J, 72136 type.	CR702 by-pass Figure 5-55
C727		Reference Designation Cancelled.	
C728		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 33 uuf. ±5%; type no. CM15C330J, 72136 type.	V706 Output Coupling Figure 5-55
C729		Same as C704.	V706 Screen by-pass Figure 5-55
C730		Same as C728.	V706 Plate Coupling Figure 5-55
C731		Same as C714.	S702 Feedthru by-pass Figure 5-55
C732		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 47 uuf. ±5%; type no. CM15C470J, 72136 type.	V707A Grid Coupling Figure 5-55
C733		Reference Designation Cancelled.	S702 Feedthru by-pass Figure 5-55
C734		Same as C704.	V707B Plate by-pass Figure 5-55
C735		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	V707 Grid Coupling Figure 5-55
C736		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 120 uuf. ±5%; type no. CM15C121J, 81349 type.	L705 Padder Figure 5-55
C737		Same as C712.	Divider Plate Supply Feedthru by-pass Figure 5-55
C738		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 3300 uuf. ±5%; type no. CM30D332J, 72136 type.	V708B Grid Coupling Figure 5-55
C739		Same as C704.	V708 Grid Plate by-pass Figure 5-55

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C740		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 2000 uuf. ±5%; type no. CM20C202J, 72136 type.	V709 Grid Coupling Figure 5-55
C741		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 4700 uuf. ±5%; type no. CM35D472J, 72136 type.	V709 Grid Padder Figure 5-55
C742		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22404T15.	V709 Plate Supply by-pass Figure 5-55
C743		Same as C740.	V709 Plate Coupling Figure 5-55
C744		Same as C742.	V709 Screen by-pass Figure 5-55
C745		Same as C714.	V709 Screen Supply Feedthru by-pass Figure 5-55
C746		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 5 uuf. ±0.05 uuf. tol.; type no. CC20CH050D, 91984 type.	V704 Grid Suppressor Figure 5-55
C747		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 1000 uuf. ±5%; type no. CM30C102J, 72136 type.	V703 Plate Filter Figure 5-55
CR701		SEMICONDUCTOR DEVICE, DIODE: germanium; type, 1N JAN type no. 1N198, 71840 type.	Oven Control Rectifier Figure 5-55
CR702		SEMICONDUCTOR DEVICE, DIODE: silicon; type, 1N JAN type no. 1N457, 81349 type.	V704 AGC Figure 5-55
CR703		Same as CR702.	Crystal Oscillator Control Figure 5-55
EV701		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	V701 Figure 5-55
EV702		Same as EV701.	V702 Figure 5-55
EV703		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-3.	V703 Figure 5-55
EV704		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-2.	V704 Figure 5-55
EV705		Same as EV704.	V705 Figure 5-55
EV706		Same as EV704.	V706 Figure 5-55
EV707		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-4.	V707 Figure 5-55
EV708		Same as EV707.	V708 Figure 5-55
EV709		Same as EV701.	V709 Figure 5-55
J701		Reference Designation Cancelled.	
J702		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact straight; 98291 dwg/part no. SKT-2BC.	V706 Plate Test Figure 5-55
J703		Same as J702.	V707B Grid Test Point Figure 5-55
J704		Reference Designation Cancelled.	
J705		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 dwg/part no. FXR95225.	Crystal Oscillator Divider Output Figure 5-55

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J706		Same as J702.	Divider 100 KC Test Figure 5-55
J707		Same as J705.	Crystal Oscillator Output Figure 5-55
J708		Same as J705.	
J709		Same as J705.	S701 Crystal Oscillator Input Figure 5-55
L701		REACTOR: 500 mh.; HS metal closed case; Mil-T-27A type no. TF4RX20YY, 42498 dwg/part no. B29379.	V701 Plate Tank Figure 5-55
L702		CHOKE, RADIO FREQUENCY: single layer wound; unshielded; 3.1 uh. ±10% at 7.9 mc; powdered iron form; 42498 dwg/part no. B29679.	Crystal Oscillator Filaments Heater Choke Figure 5-55
L703		Same as L702.	Crystal Oscillator Filaments Heater Choke Figure 5-55
L704		COIL, RADIO FREQUENCY: 1 pi, 332 turns per pi; shielded; .9 mh ±10% at 790 kc; powdered iron core; 42498 dwg/part no. B29682.	V705 Plate Tuning Figure 5-55
L705		COIL, RADIO FREQUENCY: 1 pi, 285 turns per pi; shielded; 680 uh. ±10% at 790 kc; powdered iron core; 42498 dwg/part no. B29683.	V707B Grid Tuning Figure 5-55
L706		COIL, RADIO FREQUENCY: 1 pi, 450 turns per pi; shielded; 1.7 uh. ±10% at 250 kc; powdered iron core; 42498 dwg/part no. B29681.	V708B Grid Tuning Figure 5-55
L707		COIL, RADIO FREQUENCY: 1 pi, duo lateral wound, 850 turns per pi; unshielded; 5.3 uh. ±10% at 250 kc; ceramic form, powdered iron core; 42498 dwg/part no. B29680.	V709 Plate Tuning Figure 5-55
P701		Reference Designation Cancelled.	
P702		Reference Designation Cancelled.	
P703		Reference Designation Cancelled.	
P704		Reference Designation Cancelled.	
R701		Reference Designation Cancelled.	
R702		Reference Designation Cancelled.	
R703		RESISTOR, FIXED COMPOSITION: 220 OHMS ±5% ½ W; type no. RC20GF221J, 01121 type.	V701 Cathode Figure 5-55
R704		RESISTOR, FIXED COMPOSITION: 33,000 ohms ±5% ½ W; type no. FC20GF333J, 01121 type.	V701 Screen Dropping Figure 5-55
R705		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% ½ W; type no. RC20GF473J, 01121 type.	V702 Plate B+ Dropping Figure 5-55
R706		Reference Designation Cancelled.	
R707		RESISTOR, FIXED COMPOSITION: 1 megohm ±5% ½ W; type no. RC20GF105J, 01121 type.	V702 Grid Load Figure 5-55
R708		RESISTOR, FIXED COMPOSITION: 100,000 ohms ±5% ½ W; type no. RC20GF104J, 01121 type.	V702 Plate Load Figure 5-55
R709		RESISTOR, FIXED COMPOSITION: 3300 ohms ±5% ½ W; type no. RC20GF332J, 01121 type.	V702 Cathode Figure 5-55
R710		Same as R708.	V703 Grid Load Figure 5-55
R711		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% ½ W; type no. RC20GF103J, 01121 type.	V703 Grid Figure 5-55

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R712		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% 1 W; type no. RC32GF221J, 01121 type.	V703 Cathode Figure 5-55
R713		RESISTOR, FIXED COMPOSITION: 200,000 ohms ±5% ½ W; type no. RC20GF204J, 01121 type.	V703 Voltage Divider Figure 5-55
R714		Same as F711.	V703 Voltage Divider Figure 5-55
R715		RESISTOR, FIXED COMPOSITION: 39,000 ohms ±5% ½ W; type no. RC20GF393J, 01121 type.	CR701 Isolating Figure 5-55
R716		RESISTOR, FIXED COMPOSITION: 150,000 ohms ±5% ½ W; type no. RC20GF154J, 01121 type.	V704 Grid Isolating Figure 5-55
R717		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V704 Grid Suppressor Figure 5-55
R718		RESISTOR, FIXED COMPOSITION: 6800 ohms ±5% ½ W; type no. RC20GF682J, 01121 type.	V704 Cathode Figure 5-55
R719		Same as R716.	V704 Isolating Figure 5-55
R720		RESISTOR, FIXED COMPOSITION: 2700 ohms ±5% ½ W; type no. RC20GF272J, 01121 type.	V704 Plate Load Figure 5-55
R721		Same as R716.	V704 B+ Dropping Figure 5-55
R722		RESISTOR, FIXED COMPOSITION: 470,000 ohms ±5% ½ W; type no. RC20GF474J, 01121 type.	V705 Grid Load Figure 5-55
R723		RESISTOR, FIXED COMPOSITION: 150 ohms ±5% ½ W; type no. RC20GF151J, 01121 type.	V705 Cathode Figure 5-55
R724		RESISTOR, FIXED COMPOSITION: 180,000 ohms ±5% ½ W; type no. RC20GF184J, 01121 type.	V704 Screen Divider Figure 5-55
R725		Same as R716.	V704 AGC Load Figure 5-55
R726		RESISTOR, FIXED COMPOSITION: 22,000 ohms ±5% ½ W; type no. RC20GF223J, 01121 type.	V705 Plate Load Figure 5-55
R727		Same as R726.	V705 Screen B+ Dropping Figure 5-55
R728		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% ½ W; type no. RC20GF102J, 01121 type.	V706 Cathode Isolating Figure 5-55
R729		Same as R711.	V704 Screen Divider Figure 5-55
R730		Same as R726.	V706 Grid Load Figure 5-55
R731		Same as R728.	V706 Cathode Figure 5-55
R732		RESISTOR, FIXED COMPOSITION: 15,000 ohms ±5% ½ W; type no. RC20GF153J, 01121 type.	V706 Screen B+ Dropping Figure 5-55
R733		RESISTOR, FIXED COMPOSITION: 8200 ohms ±5% ½ W; type no. RC20GF822J, 01121 type.	V706 Plate Load Figure 5-55
R734		Same as R733.	CR703 Isolating Figure 5-55
R735		Same as R711.	V707A Grid Load Figure 5-55
R736		RESISTOR, FIXED COMPOSITION: 680 ohms ±5% ½ W; type no. RC20GF681J, 01121 type.	V707A Cathode Figure 5-55

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R737		RESISTOR, FIXED COMPOSITION: 27,000 ohms ±5% ½ W; type no. RC20GF273J, 01121 type.	V707A Plate Load Figure 5-55
R738		Same as R726.	V707B Grid Test Figure 5-55
R739		Same as R728.	B707B Grid Isolating Figure 5-55
R740		Same as R720.	V707 Plate B+ Dropping Figure 5-55
R741		Same as R709.	V708A Grid Voltage Divider Figure 5-55
R742		RESISTOR, FIXED COMPOSITION: 1500 ohms ±5% ½ W; type no. RC20GF152J, 01121 type.	V708B Grid Figure 5-55
R743		Same as R736.	V708 Cathode Figure 5-55
R744		RESISTOR, FIXED COMPOSITION: 18,000 ohms ±5% ½ W; type no. RC20GF183J, 01121 type.	V708A Plate Load Figure 5-55
R745		Same as R720.	V708 Plate B+ Dropping Figure 5-55
R746		RESISTOR, FIXED COMPOSITION: 1200 ohms ±5% ½ W; type no. RC20GF122J, 01121 type.	V708B Grid Divider Figure 5-55
R747		RESISTOR, FIXED COMPOSITION: 6800 ohms ±5% ½ W; type no. RC20GF682J, 01121 type.	V708 Grid Figure 5-55
R748		RESISTOR, FIXED COMPOSITION: 2.7 megohms ±5% ½ W; type no. RC20GF275J, 01121 type.	V709 Grid Load Figure 5-55
R749		Same as R728.	V709 Plate B+ Dropping Figure 5-55
R750		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V709 Cathode Figure 5-55
R751		Same as R705.	V709 Screen Dropping Figure 5-55
R752		Same as R750.	V709 Screen Parasitic Suppressor Figure 5-55
R753		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% 2 W; type no. RC42GF472J, 81349 type.	Voltage Dropping Figure 5-55
R754	3	RESISTOR, FIXED COMPOSITION: 10,000 to 39,000 ohms ±5% ½ W; type no. RC20GF . . . . J, 01121 type.	J707 Output Termination Figure 5-55
R755		RESISTOR, VARIABLE COMPOSITION: 1000 ohms 1 W; 80294 dwg/part no. 224L-1-102.	A701 Vernier Oven Temperature Control Figure 5-55
S701		SWITCH, ROTARY: 3 pole, 2 position; 81716 dwg/part no. 222586-A1.	INT/EXT Frequency Standard Switch Figure 5-55
S702		Reference Designation Cancelled.	
T701		TRANSFORMER, AUDIO FREQUENCY: primary 4100 ohms impedance, secondary 40 ohms impedance; HS metal case; frequency response 300 cps to 5000 cps ±0.5 db; type no. TF4RX13YY; 42498 dwg/part no. C38252.	V703 Figure 5-55
V701		ELECTRON TUBE: pentode; miniature; Mil-E-1D type no. 5654/6AK5W, 24446 type.	Oven Oscillator Figure 5-55
V702		Same as V701.	Oven Amplifier Figure 5-55

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
V703		ELECTRON TUBE: miniature, receiving; type no. JAN 6005/6AQ5, 24446 type.	Oven Driver Figure 5-55
V704		ELECTRON TUBE: miniature, receiving; type no. JAN 5749/6BA6W, 49671 type.	1 MC Crystal Amplifier Figure 5-55
V705		Same as V704.	1 MC Amplifier Figure 5-55
V706		Same as V704.	Buffer Amplifier Figure 5-55
V707		ELECTRON TUBE: twin triode, reliable miniature, receiving; type no. 5670, 49671 type.	500 KC Divider Figure 5-55
V708		Same as V707.	100 KC Divider Figure 5-55
V709		Same as V701.	100 KC Buffer Figure 5-55
XV701		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	For V701 Figure 5-55
XV702		Same as XV701.	For V702 Figure 5-55
XV703		Same as XV701.	For V703 Figure 5-55
XV704		Same as XV701.	For V704 Figure 5-55
XV705		Same as XV701.	For V705 Figure 5-55
XV706		Same as XV701.	For V706 Figure 5-55
XV707		SOCKET, ELECTRON TUBE: 9, miniature; type no. TS103P01, 91662 type.	For V707 Figure 5-55
XV708		Same as XV707.	V708 Figure 5-55
XV709		Same as XV701.	For V709 Figure 5-55
801-899		SYNTHESIZER: c/o harmonic generator 1 tube, input 20 kc, outputs 20 kc, 80 kc, 140 kc, synthesizer frequency divider, 20 kc to 0.5 kc, 2 tubes, pulse shaper and blocking oscillator, input 0.5 kc, output 0.5 kc harmonics from 720 to 820 kc, 2 tubes; injection mixer and 140 kc injection amplifier, bandswitch 4 kc, 2 tubes, fil, 6.3 vac, plate 160 vdc; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A20258-2.	
C801		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 470 μμf. ±5%; type no. CM15C471J, 72136 type.	V801 Grid Coupling Figure 5-65
C802		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22404T15.	V801 Screen by-pass Figure 5-65
C803		CAPACITOR, FIXED PAPER DIELECTRIC: 600 vdc working 0.01 uf. ±5%; type no. CZ24BKF103, 81831 type.	Synthesizer Plate Supply by-pass Figure 5-65
C804		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.33 uf. ±20%; 56289 dwg/part no. 118P33404T15.	Synthesizer Plate Filter by-pass Figure 5-65
C805		Same as C804.	V801 Plate Supply by-pass Figure 5-65
C806		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 100 uuf. ±5%; type no. CM15C101J, 72136 type.	FL801 Blocking Figure 5-65

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C807		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 120 uuf. ±5%; type CM15C121J, 72136 type.	V802A Grid Coupling Figure 5-65
C808		Same as C804.	V802B Plate by-pass Figure 5-65
C809		CAPACITOR, FIXED METALIZED PAPER DIELECTRIC; 400 vdc working 0.015 uf ±20%; 00656 dwg/part no. P123ZNP-400V153M.	V802B Grid Coupling Figure 5-65
C810		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 4300 uuf. ±5%; type no. CM35D432J, 72136 type.	L802 Padder Figure 5-65
C811		CAPACITOR, FIXED METALIZED PAPER DIELECTRIC: 400 vdc working .033 uf. ±20%; 00656 dwg/part no. P123ZNP-400V333M.	V803B Grid Coupling Figure 5-65
C812		CAPACITOR, FIXED METALIZED PAPER DIELECTRIC: 200 vdc working 12 uf. ±20%; 82376 dwg/part no. RQLS2-12M-T.	V803B Plate by-pass Figure 5-65
C813		Reference Designation Cancelled.	FL802 Padder Figure 5-65
C814		CAPACITOR, FIXED METALIZED PAPER DIELECTRIC: 200 vdc working 0.033 uf ±20%; 00656 dwg/part no. P1Z3ZNP-200V333M.	V804A Grid Network Figure 5-65
C815		Same as C803.	V805A Plate Feedthru by-pass Figure 5-65
C816		Same as C804.	V804B Plate by-pass Figure 5-65
C817		Same as C801.	V804B Grid Coupling Figure 5-65
C818		Same as C804.	V805A Plate Supply by-pass Figure 5-65
C819		Same as C804.	V805A Plate Supply by-pass Figure 5-65
C820		Same as C801.	V805A Grid Coupling Figure 5-65
C821		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V805A Cathode by-pass Figure 5-65
C822		Same as C814.	V805B Grid Network Figure 5-65
C823		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 10 uuf. ±5%; type no. CM15C100J, 72136 type.	V805 Test Point Coupling Figure 5-65
C824		CAPACITOR, VARIABLE CERAMIC DIELECTRIC: 500 vdc working 3 to 13 uuf. ±2%; type no. CV11B130, 72982 type.	V805 Plate Trimmer Figure 5-65
C825		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 0.0018 uf. ±20%; 72982 dwg/part no. 831-011X500-182M.	V805 Plate Coupling Figure 5-65
C826		CAPACITOR, VARIABLE CERAMIC DIELECTRIC: 500 vdc working 7.0 to 45.0 uuf. ±2%; type no. CV11D450, 72982 type.	Mixer Input Trimmer Figure 5-65
C827		Same as C821.	V804 and V805 Heater by-pass Figure 5-65
C828		Same as C821.	V804 and V805 Heater by-pass Figure 5-65
C829		Same as C821.	V806 Cathode by-pass Figure 5-65
C830		CAPACITOR, FIXED PAPER DIELECTRIC: 100 vdc working 0.1 uf ±5%; type no. CZ24BKB104, 81831 type.	Synthesizer Filament Feedthru by-pass Figure 5-65

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C831		Same as C804.	V806 Screen by-pass Figure 5-65
C832		Same as C830.	Synthesizer Filament Feedthru by-pass Figure 5-65
C833		Same as C821.	V807 Cathode by-pass Figure 5-65
C834		Same as C804.	V807 Screen by-pass Figure 5-65
C835		Same as C809.	V807 Plate Coupling Figure 5-65
C836		Same as C801.	TP J814 by-pass Figure 5-65
C837		Same as C809.	FL802 Figure 5-65
EV801		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	V801 Figure 5-65
EV802		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-5.	V802 Figure 5-65
EV803		Same as EV802.	V803 Figure 5-65
EV804		Same as EV802.	V804 Figure 5-65
EV805		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-4.	V805 Figure 5-65
EV806		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-2.	V806 Figure 5-65
EV807		Same as EV801.	V807 Figure 5-65
FL801		FILTER, BAND PASS: 15 kc to 25 kc bandwidth, 47,000 ohms input, 15,000 ohms output; 42498 dwg/part no. B28739.	Synthesizer 20 KC Figure 5-65
FL802		FILTER, BAND PASS: 980 to 1020 cps bandwidth, 680,000 ohms input, 1 megohm output; 42498 dwg/part no. B28707.	Synthesizer 140 KC Figure 5-65
FL803		FILTER, BAND PASS: 720 to 820 kc bandwidth, 47,000 ohms input, 1 megohm output; 42498 dwg/part no. B29213.	Synthesizer Figure 5-65
FL804		FILTER, BAND PASS: 139.8 to 140.2 kc bandwidth, 47,000 ohms input, 1 megohm output; 42498 dwg/part no. C38253-1.	Synthesizer Figure 5-65
J801		CONNECTOR, RECEPTACLE ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	V801 20 KC Input Figure 5-65
J802		CONNECTOR, RECEPTACLE ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V801 Grid Test Point Figure 5-65
J803		Same as J802.	T803 80 KC Test Point Figure 5-65
J804		Same as J801.	V801 80 KC Output Figure 5-65
J805		Same as J801.	Synthesizer 140 KC Tank Figure 5-65
J806		Same as J802.	FL801 20 KC Test Point Figure 5-65

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J807		Same as J802.	V803A 20 KC Test Point Figure 5-65
J808		Same as J802.	V804A 1 KC Test Point Figure 5-65
J809		Same as J802.	V805 Plate Test Point Figure 5-65
J810		Same as J802.	V806 Grid Test Point Figure 5-65
J811		Same as J801.	Mixer 140 KC Input Figure 5-65
J812		Same as J802.	V806 Grid 140 KC Test Point Figure 5-65
J813		Same as J802.	V807 Grid Test Figure 5-65
J814		Same as J802.	V807 Plate 140 KC Output Test Figure 5-65
J815		Same as J801.	V807 Plate 140 KC Output Test Figure 5-65
L801		CHOKE, RADIO FREQUENCY: 1 pi; duo lateral wound; 347 turns per pi; unshielded; 2.3 mh. ±10% at 250 kc; powered iron form; 42498 dwg/part no. B29280.	V801 Grid Filter Figure 5-65
L802		REACTOR: 0.25 hy. HS metal closed case; type no. TF4RX20YY, 42498 dwg/part no. B28705.	V802B Grid Tuning Figure 5-65
L803		CHOKE, RADIO FREQUENCY: single layer wound; unshielded; 3.1 uh. ±10% at 7.9 mc; powdered iron form; 42498 dwg/part no. B29679.	Synthesizer Filaments Figure 5-65
L804		Same as L803.	Synthesizer Filaments Figure 5-65
L805		COIL, RADIO FREQUENCY: 1 pi, 450 turns per pi; shielded; 2 mh. ±5% at 250 kc; powdered iron core; 42498 dwg/part no. B29282.	V807 Plate Tuning Figure 5-65
R801		RESISTOR, FIXED COMPOSITION: 100,000 ohms ±5% ½ W; type no. RC20GF104J, 01121 type.	V802 Grid Isolating Figure 5-65
R802		RESISTOR, FIXED COMPOSITION: 470,000 ohms ±5% ½ W; type no. RC20GF474J, 01121 type.	V801 Grid Load Figure 5-65
R803		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% ½ W; type no. RC20GF473J, 01121 type.	V801 Voltage Divider Figure 5-65
R804		Same as R801.	V801 Voltage Divider Figure 5-65
R805		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	T802Voltage Divider Figure 5-65
R806		RESISTOR, FIXED COMPOSITION: 10 ohms ±5% ½ W; type no. RC20GF100J, 01121 type.	T802 Voltage Divider Figure 5-65
R807		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% ½ W; type no. RC20GF103J, 01121 type.	FL801 Shunt Figure 5-65
R808		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% ½ W; type no. RC20GF472J, 01121 type.	V802A Plate Dropping Figure 5-65
R809		Same as R807.	FL801 Shunt Figure 5-65

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R810		Same as R808.	V802 Plate Dropping Figure 5-65
R811		RESISTOR, FIXED COMPOSITION: 6800 ohms ±5% ½ W; type no. RC20GF682J, 01121 type.	V802A Grid Impedance Matching Figure 5-65
R812		Same as R801.	V802A Grid Impedance Matching Figure 5-65
R813		RESISTOR, FIXED COMPOSITION: 1800 ohms ±5% ½ W; type no. RC20GF182J, 01121 type.	V802 Cathode Figure 5-65
R814		RESISTOR, FIXED COMPOSITION: 27,000 ohms ±5% ½ W; type no. RC20GF273J, 01121 type.	V802A Plate Load Figure 5-65
R815		RESISTOR, FIXED COMPOSITION: 5600 ohms ±5% ½W; type no. RC20GF562J, 01121 type.	V802 Isolating Figure 5-65
R816		Same as R801.	V803 Isolating Figure 5-65
R817		RESISTOR, FIXED COMPOSITION: 15,000 ohms ±5% ½ W; type no. RC20GF153J, 01121 type.	V803 Grid Divider Figure 5-65
R818		Same as R817.	V803 Grid Voltage Divider Figure 5-65
R819		RESISTOR, FIXED COMPOSITION: 220,000 ohms ±5% ½ W; type no. RC20GF224J, 01121 type.	V803 Grid Suppressor Figure 5-65
R820		Same as R808.	V803 Cathode Figure 5-65
R821		RESISTOR, FIXED COMPOSITION: 68,000 ohms ±5% ½ W; type no. RC20GF683J, 01121 type.	V803 Plate Load Figure 5-65
R822		Same as R807.	V803 B+ Dropping Figure 5-65
R823		Same as R807.	V803 Isolating Figure 5-65
R824		RESISTOR. FIXED COMPOSITION: 1 megohm ±5% ½ W; type no. RC20GF105J, 01121 type.	V804 Isolating Figure 5-65
R825		Same as R801.	V804 Grid Divider Figure 5-65
R826		RESISTOR, FIXED COMPOSITION: 2.2 megohms ±5% ½ W; type no. RC20GF225J, 01121 type.	V804 Grid Filter Figure 5-65
R827		Same as R801.	V804 Grid Suppressor Figure 5-65
R828		RESISTOR, FIXED COMPOSITION: 22,000 ohms ±5% ½ W; type no. RC20GF223J, 01121 type.	V804 Plate B+ Dropping Figure 5-65
R829		Same as R803.	V804A Plate Load Figure 5-65
R830		Same as R828.	V804B Plate Load Figure 5-65
R831		Same as R803.	V805 Plate B+ Dropping Figure 5-65
R832		Same as R828.	V804B Grid Load Figure 5-65
R833		Same as R819.	V805 Plate B+ Dropping Figure 5-65
R834		Same as R824.	V805A Grid Load Figure 5-65

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R835		Same as R801.	V805A Cathode Figure 5-65
R836		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	V805B Grid Suppressor Figure 5-65
R837		RESISTOR, FIXED COMPOSITION: 330,000 ohms ±5% ½ W; type no. RC20GF334J, 01121 type.	V805B Grid Filter Figure 5-65
R838		Same as R817.	V805 Plate Isolating Figure 5-65
R839		Same as R828.	V806 Grid Isolating Figure 5-65
R840		RESISTOR, FIXED COMPOSITION: 470 ohms ±5% ½ W; type no. RC20GF471J, 01121 type.	V806 Cathode Figure 5-65
R841		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% 1 W; type no. RC32GF103J, 01121 type.	V806B+ Dropping Figure 5-65
R842		Same as R805.	V807 Grid Suppressor Figure 5-65
R843		RESISTOR, FIXED COMPOSITION: 390 ohms ±5% ½ W; type no. RC20GF391J, 01121 type.	V807 Cathode Figure 5-65
R844		Same as R807.	V807 Plate B+ Dropping Figure 5-65
T801		TRANSFORMER, PULSE: Mil-T-27A; 00262 type no. TP5QXB1-AEK1R0.	V805 Pulse Figure 5-65
T802		TRANSFORMER, INTERMEDIATE FREQUENCY: resonant frequency 140 kc; shielded; double tuned; adj. iron core tuning, incl. 2 capacitors 330 uuf ±10%; 42498 dwg/part no. C28736.	V801 IF Figure 5-65
T803		TRANSFORMER, INTERMEDIATE FREQUENCY: resonant frequency 80 kc; shielded double tuned; adj. iron core tuning, incl. 2 capacitors 1000 uf ±10%; 42498 dwg/part no. C28728.	V801 IF Figure 5-65
V801		ELECTRON TUBE: pentode, miniature; type no. 5654/6AK5W, 24446 type.	Harmonic Generator Figure 5-65
V802		ELECTRON TUBE: twin triode, reliable miniature; type no. 5814A, 94154 type.	5 KC Divider Figure 5-65
V803		Same as V802.	0.5 KC Divider Figure 5-65
V804		ELECTRON TUBE: twin triode, reliable miniature; type no. 5751, 94154 type.	Pulse Shaper Figure 5-65
V805		ELECTRON TUBE: twin triode, reliable miniature, receiving; type no. 5670, 49671 type.	Blocking Oscillator Figure 5-65
V806		ELECTRON TUBE: pentagrid converter, miniature; type no. 5750/6BE6W, 24446 type.	140 KC Amplifier Mixer Figure 5-65
V807		Same as V801.	140 KC Amplifier Figure 5-65
XV801		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V801 Figure 5-65
XV802		SOCKET, ELECTRON TUBE: 9, miniature; type no. TS103P01, 91662 type.	V802 Figure 5-65
XV803		Same as XV802.	V803 Figure 5-65
XV804		Same as XV802.	For V804 Figure 5-65

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
XV805		Same as XV802.	For V805 Figure 5-65
XV806		Same as XV801.	For V806 Figure 5-65
XV807		Same as XV801.	For V807 Figure 5-65
901-949		POWER SUPPLY: electronic; diode-bridge rectifier; two section LC filter; 2 tubes (voltage regulators) ; outputs 180 vdc, 160 vdc, 140 vdc, 105 vdc, 105 vdc, 6.3 vac 0.6A (current regulated), 6.3 vac 5A, 6.3 vac 5.6A, 3.0 vac 0.75A; power input 105/115/125 vac; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO: A20262-2.	
C901		CAPACITOR, FIXED ELECTROLYTIC: 2 sections; 250 vdc working 70 —70 uf —10 +100%; type no. CE52C700M, 82376 type.	Power Supply Filter Figure 5-3
C902		Same as C901.	L901 Choke Filter Figure 5-3
C902A		Same as C901A.	
C902B		Same as C901B.	
CR901		SEMICONDUCTOR DEVICE, DIODE: silicon; type 1N, JAN type no. 1N547, 80131 type.	Converter Power Supply Figure 5-3
CR902		Same as CR901.	Converter Power Supply Figure 5-3
CR903		Same as CR901.	Converter Power Supply Figure 5-3
CR904		Same as CR901.	Converter Power Supply Figure 5-3
CR905		SEMICONDUCTOR DEVICE, ZENER DIODE: silicon; Mil-E-1D type IN, JAN type no. 1N2970; 81350 type.	Converter Power Supply Figure 5-3
CR906		Same as CR905.	Converter Power Supply Figure 5-3
EV902		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-3.	V902 Figure 5-3
EV903		Same as EV902.	V903 Figure 5-3
L901		REACTOR: 1-2, 1.5 h. 65 ohms dc resistance; 2-3, 5 h. 120 ohms dc resistance; HS metal closed case; type no. TF4RX04YY, 42498 dwg/part no. B20027.	CR903 Filter Choke Figure 5-3
R901		RESISTOR, FIXED WIRE WOUND: 15 ohms ±5% 10 W; type no. RW29V150, 81349 type.	V901 Load Figure 5-3
R902		RESISTOR, FIXED WIRE WOUND: 2500 ohms ±5% 10 W; type no. RW29G252, 83827 type.	V902 Current Limiting Figure 5-3
R903		Same as R902.	V903 Current Limiting Figure 5-3
R904		RESISTOR, FIXED WIRE WOUND: 350 ohms ±5% 10 W; type no. RW29G351, 83827 type.	L901 Filter Figure 5-3
R905		RESISTOR, FIXED WIRE WOUND: 3.3 ohms ±5% 3W; Mil-R-26C type no. RW59V3R3, 01121 type.	Converter Power Supply Figure 5-3

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T901		TRANSFORMER, POWER, STEP DOWN AND STEP UP: HS metal case, primary (1-2-3-4) 100/110/120 v, 50/60 cycles, single phase; secondary (5-6) 210 vrms, 190 vdc at 0.2 amp; secondary (7-8-9) 6.3 vrms C.T., 5.6 amp; type TF4RX03YY, 42498 dwg/part no. B28704.	Converter Power Supply Figure 5-3
V902		ELECTRON TUBE: diode, miniature; type no. OB2WA, 49671 type.	Voltage Regulator Figure 5-3
V903		Same as V902.	Voltage Regulator Figure 5-3
XC901		SOCKET, CAPACITOR: Octal, Mica, W1 bushings; type no. TS101P02, 91662 type.	V902 and V903 Figure 5-3
XC902		Same as XC901.	L901 Figure 5-3
XV902		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V902 Figure 5-3
XV903		Same as XV902.	V903 Figure 5-3
951-999		BLISTER: c/o converter unit input/output cable terminations; contains reel E951; inputs, antenna, ext 1 mc, ac power; outputs, signal if., carrier, controls; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A19004.	
C951		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 10,000 uuf +80 −20%, type no. CK63AW103X, 00656 type.	AC Line Filters Figure 5-75
C952		Same as C951.	AC Line Filters Figure 5-75
J951		CONNECTOR, RECEPTACLE, ELECTRICAL: 12 rd. contacts, 6 male, 6 female; straight, 74868 type no. M6A modified per 42498 dwg/part no. C18567-3.	Ext. Std. Switch LD Blister 1 MC Output Figure 5-75
J952		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; type no. UG290/U, 80058 type.	P952 Ext. 1 MC LD Blister 1 MC Input Figure 5-75
J953		Same as J952.	P953 80 KC Signal IF Out LD Blister Figure 5-75
J954		Same as J952.	P954 80 KC Carrier Output LD Blister Figure 5-75
J955		Reference Designation Cancelled.	
J956		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight, type no. AN3102A-16S-5P, 88044 type.	P956 LD Blister Power Input Figure 5-75
J957		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight, JAN part no. UG-58A/U, 80058 type.	P957 LD Blister Antenna Figure 5-75
J958		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight, type no. AN3102A-14S-7P, 88044 type.	P958 LD Blister Control Figure 5-75
P951		Reference Designation Cancelled.	
P952		CONNECTOR, PLUG, ELECTRICAL: 1 rd. male contact, straight; type no. UG-88C/U, 91737 type.	EXT 1 MC Input Connector
P953		Same as P952.	80 KC Signal IF Output LD Blister
P954		Same as P952.	80 KC Carrier Output LD Blister
P955		CONNECTOR, RECEPTACLE, ELECTRICAL: 2 male contacts, curved lip; 74545 dwg/part no. 7464.	J605 AC Power LD Blister Figure 5-75

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
P956		CONNECTOR, PLUG, ELECTRICAL: 3 rd. male contacts, straight; type no. AN3106A-16S-5S, 88044 type.	p/o W603
P957		CONNECTOR, PLUG, ELECTRICAL: 1 rd. male contact, straight; type no. UG-21B/U, 80058 type.	ANT IN Input Connector
P958		CONNECTOR, PLUG, ELECTRICAL: 3 rd. female contacts, straight; type no. AN3106A-14S-7S, 88044 type.	p/o W603
1001-1899		This series of reference designations is used in INTERMEDIATE FREQUENCY-AUDIO FREQUENCY AMPLIFIER AM-24777A WRR-2.	
2801-2899		ANTENNA COUPLER: input signal attenuator; c/o protective fuse, four position switch with attenuation resistors; input impedance 52 ohms; output impedance 52 ohms; maximum signal attenuation approximately 45 db in three steps; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A31090-2.	
C2801		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 5100 uuf ±2%; 81349 type no. CM07F512G03.	p/o 1700 kc trap Figure 5-9
F2801		FUSE, CARTRIDGE: ¼ amp 250 v; type no. F02GR250A, 98997 type.	Antenna Coupler Figure 5-9
J2801		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact; straight; 74868 type no. FXR95225.	Antenna Coupler Output
J2802		Same as J2801.	Antenna Coupler Input Figure 5-9
L2801		COIL, RADIO FREQUENCY: closewound; 1.65 uh, 7.9 mc, powdered iron core; 42498 dwg/part no. B19652-2.	p/o 1700 kc trap Figure 5-9
R2801		RESISTOR, FIXED, COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	Antenna Attenuator Figure 5-9
R2802		RESISTOR, FIXED, COMPOSITION: 10 ohms ±5% ½ W; type no. RC20GF100J, 01121 type.	Antenna Attenuator Figure 5-9
R2803		RESISTOR, FIXED, COMPOSITION: 82 ohms ±5% ½ W; type no. RC20GF820J, 01121 type.	Antenna Attenuator Figure 5-9
R2804		RESISTOR, FIXED, COMPOSITION: 560 ohms ±5% 2 W; type no. RC42GF561J, 01121 type.	Antenna Attenuator Figure 5-9
R2805		Same as R2804.	Antenna Attenuator Figure 5-9
R2806		Same as R2802.	Antenna Attenuator Figure 5-9
R2807		Same as R2804.	Antenna Attenuator Figure 5-9
R2808		Same as R2804.	Antenna Attenuator Figure 5-9
S2801		SWITCH ROTARY: 3 pole, 4 position, shorting, 81716 type no. 222582-A1.	Antenna Coupler Figure 5-9
XF2801		FUSEHOLDER: 42498 dwg/part no. B31045.	For F2801 Figure 5-9
651-699		DEMODULATOR UNIT PANEL/CHASSIS: c/o front panel controls; meters; switches; terminal boards; chassis brackets for mounting sub-assemblies; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO'S A20142-2, A20143-3.	
BL651		FAN, AXIAL: 4 blades, open type, .00285 hp motor, 110 vac, 60 cycle, single phase; w/thermostatic switch; 25140 type no. 19A552.	Cabinet Ventilation Figure 6-10
C651		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 1 uf ±10%; type no. CP53B1KE105K, 83125 type.	Fan Motor Figure 6-10

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
F651		FUSE, CARTRIDGE: 2 amp, 125 v; type no. F0202R200B, 98997 type.	Demodulator Power Supply Figure 3-1
F652		FUSE, CARTRIDGE: ½ amp, 250 v; type no. F02GR500B, 98997 type.	Fan Motor Figure 3-1
J651		CONNECTOR, RECEPTACLE, ELECTRICAL: 16 rd. male contacts, straight, 91146 dwg/part no. DPX-B16C3-34P.	80 KC Filter Figure 6-11
J652		CONNECTOR, RECEPTACLE, ELECTRICAL: type no. JJ034, 82389 type.	Line B Phones Figure 3-1
J653		Same as J652.	Line A Phones Figure 3-1
M651		METER, AUDIO LEVEL: range −12 db to +22 db, 5000 ohms minimum impedance, accuracy ±5% of full scale, 42498 dwg/part no. B29293.	Line A Output Figure 3-1
M652		Same as M651.	Line B Output Figure 3-1
R651		RESISTOR, VARIABLE COMPOSITION: 100,000 ohms ±10% ½ W; type no. RV4NAYSD104C, 71450 type.	AF Level Line A Figure 3-1
R652		Same as R651.	AF Level Line B Figure 3-1
R653		RESISTOR, VARIABLE: 2 section, each section 2500 ohms ±20%, 2 W; standard C taper; 42498 dwg/part no. C19741.	Phone Level Figure 3-1
S651		SWITCH, THERMOSTATIC: disc type, HS, normally open, contacts open at 86 F ±5 F. contacts to close at 112 F ±5 F; 2 amp 115 vac; SPST; 82647 dwg/part no. M1112086271.	Axial Fan Protection
S653		SWITCH, TOGGLE: SPST; Mil-S-21195 type no. ST42A, 81350 type.	Upper Fast Slow Figure 3-1
S654		SWITCH, TOGGLE, SPST; type no. ST52P, 81350 type.	On Off AGC (Upper) Figure 3-1
S655		SWITCH, TOGGLE, SPST; type no. ST52N, 81350 type.	Lower Fast Slow Figure 3-1
S656		Same as S654.	On Off AGC (Lower) Figure 3-1
S657		Same as S653.	Reception AM/SSB Figure 3-1
S658		SWITCH, TOGGLE: SPST; type no. ST52K, 81350 type.	Power On/Off Figure 3-1
W651		CABLE ASSEMBLY, RADIO FREQUENCY: RG-188/U coaxial, 50 ohms impedance; c/o 1 94375 type no. RFC-0701-35 connector (P1301) on one end and J651 on the other; 42498 dwg/part no. B31382-3.	Interconnecting Coax Cable Figure 6-8
W652		CABLE ASSEMBLY, RADIO FREQUENCY: RG-188/U coaxial, 50 ohms impedance; c/o 1 94375 type no. RFC-072-35 connector (P1102) on one end and J651 on the other; 42498 dwg/part no. B31382-2.	Interconnecting Coax Cable Figure 6-8
W653		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U coaxial, 50 ohms impedance; c/o 2 connectors, 42498 dwg/part no. A18403 (P1302 and P1001); 42498 dwg/part no. C31375-13.	Interconnecting Coax Cable Figure 6-8
W654		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U coaxial, 50 ohms impedance; c/o 1 connector, 42498 dwg/part no. A18403 (P1601) on one end and 1 74868 type no. 48175 connector (P1303) on the other; 42498 dwg/part no. C31375-14.	Interconnecting Coax Cable Figure 6-10

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
W655		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U coaxial, 50 ohms impedance; c/o 2 connectors, 42498 dwg/part no. A18403 (P1002 and P1103); 42498 dwg/part no. C31375-15.	Interconnecting Coax Cable Figure 6-8
W656		CABLE ASSEMBLY, RADIO FREQUENCY: RG-58C/U coaxial, 50 ohms impedance; c/o 2 connectors 42498 dwg/part no. A18403 (P1003 and P1101); 42498 dwg/part no. C31375-16.	Interconnecting Coax Cable Figure 6-8
XF651		FUSEHOLDER: Cartridge, plastic; Mil-F-19207; 75915 dwg/part no. 349250.	Socket for F651 Figure 3-1
XF652		Same as XF651.	Socket for F652 Figure 3-1
701-999		This series of reference designations is used in ELECTRONIC FREQUENCY CONVERTER CV-920A/WRR-2.	See page 7-29
1001-1099		USB DETECTOR-AMPLIFIER: c/o 78 kc if. amplifier, bandwidth 3.7 kc, 3 tubes; AGC amplifier, 78 kc, 2 tubes 2 diodes; USB demodulator, 78 kc, bandwidth 3.7 kc, 1 tube, circuit gain X4 to X5; audio amplifier, frequency range 300 to 4000 cps, output 60 mw 600 ohm load, output (phones) 15 mw 600 ohm load, 2 tubes, adjustable threshold, 1 tube; fil 6.3 vac plate 180 v and 160 vdc; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A20399-2.	
C1001		CAPACITOR, FIXED PAPER DIELECTRIC: 100 vdc working 0.1 uf ±20%; type no. CZ24BKB104, 81831 type.	Upper Sideband Amplifier Filaments Feedthru Figure 5-49
C1002		Same as C1001.	Upper Sideband Amplifier Filament Feedthru Figure 5-49
C1003		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 220 uuf. ±5%; type no. CM15C221J, 72136 type.	V1001 Grid Coupling Figure 5-49
C1004		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 150 uuf. ±5%; type no. CM15C151J, 72136 type.	V1001 Screen Shunt Padder Figure 5-49
C1005		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V1001 Cathode by-pass Figure 5-49
C1006		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15404T15.	V1001 Screen by-pass Figure 5-49
C1008		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 1000 uuf. ±5%; type no. CM20C102J, 42498 type.	V1002A Coupling Figure 5-49
C1009		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.15 uf. ±20%; 56289 type no. 118P15402T15.	V1002A Cathode by-pass Figure 5-49
C1010		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.01 uf. ±20%; 00656 dwg/part no. P123ZNP200V103M.	V1005 and V1006 AGC Filter Figure 5-49
C1011		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 1 uf. ±20%; 56289 dwg/part no. 118P10502T15.	V1002B Grid by-pass Figure 5-49
C1012		CAPACITOR, FIXED PAPER DIELECTRIC: 150 vdc working 4 uf. ±20%; 00656 dwg/part no. P16ZN150V402M.	V1005 and V1006 AGC Time Constant Figure 5-49
C1013		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 100 uuf. ±5%; Mil-C-5B type no. CM15C101J, 72136 type.	V1003 Grid Coupling Figure 5-49
C1014		Same as C1009.	V1003 AGC by-pass Figure 5-49
C1015		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. +80 −20%; type no. CK70A102X, 00656 type.	V1003 Cathode Feedthru Figure 5-49

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C1016		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.047 uf. ±20%; 56289 dwg/part no. 118P47304T15.	V1003 Cathode by-pass Figure 5-49
C1017		Same as C1006.	V1003 Screen B+ by-pass Figure 5-49
C1018		Same as C1004.	V1004 Shunt Padder Figure 5-49
C1019		Same as C1005.	V1004 Cathode by-pass Figure 5-49
C1020		Reference Designation Cancelled.	
C1021		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.033 uf. ±20%; 00656 dwg/part no. P123ZNP400V333M.	V1004 Plate Coupling Figure 5-49
C1022		Same as C1006.	V1004 Screen by-pass Figure 5-49
C1023		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 15 uuf. ±5%; type no. CM15C150J, 72136 type.	V1004 Shunt Padder Figure 5-49
C1024		CAPACITOR, FIXED PAPER DIELECTRIC: 600 vdc working 0.01 uf. ±5%; type no. CZ24BKF103, 81831 type.	V1004 Screen Feedthru by-pass Figure 5-49
C1025		Same as C1023.	V1005 Grid Shunt Padder Figure 5-49
C1026		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 470 uuf. ±5%; type no. CM15C471J, 72136 type.	V1005 Grid Coupling Figure 5-49
C1027		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.33 uf. ±20%; 56289 dwg/part no. 118P33404T15.	V1005 Screen by-pass Figure 5-49
C1028		Same as C1026.	V1006 Shunt Padder Figure 5-49
C1029		Same as C1003.	V1006 Grid Coupling Figure 5-49
C1030		Same as C1005.	
C1031		Same as C1027.	V1006 Screen by-pass Figure 5-49
C1032		Same as C1013.	V1007 Feedback Figure 5-49
C1033		Same as C1024.	V1007 Cathode Feedthru by-pass Figure 5-49
C1034		Same as C1016.	V1007 Screen by-pass Figure 5-49
C1035		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.22 uf. ±20%; 56289; dwg/part no. 118P22404T15.	V1007 Screen B+ by-pass Figure 5-49
C1036		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.015 uf. ±20%; 00656 dwg/part no. P123ZNP400V153M.	V1008 Grid Coupling Figure 5-49
C1037		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.033 uf. ±20% 00656 dwg/part no. P123ZNP200V333M.	AGC Filter Figure 5-49
C1038		Reference Designation Cancelled.	
C1039		Same as C1036.	V1008 Figure 5-49
CR1001		SEMICONDUCTOR DEVICE, DIODE: germanium; type 1N, JAN type no. 1N198 71840 type.	V1002 Figure 5-49
CR1002		SEMICONDUCTOR DEVICE, DIODE: silicon; type 1N, JAN type no. 1N458, 80131 type.	V1005 and V1006 AGC Figure 5-49

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
EV1001		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	V1001 Figure 5-49
EV1002		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-5.	V1002 Figure 5-49
EV1003		Same as EV1001.	V1003 Figure 5-49
EV1004		Same as EV1001.	V1004 Figure 5-49
EV1005		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-2.	V1005 Figure 5-49
EV1006		Same as EV1005.	V1006 Figure 5-49
EV1007		Same as EV1001.	V1007 Figure 5-49
EV1008		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-3.	V1008 Figure 5-49
FL1001		FILTER, BAND PASS: 76 to 79.7 kc band-width within 3 db, 1500 ohms input and output; 42498 dwg/part no. B29186.	USB IF 78 KC V1004 Figure 5-49
J1001		CONNECTOR, RECEPTACLE ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	Upper Sideband V1003 Signal Input J1302 Figure 5-49
J1002		Same as J1001.	Upper Sideband V1003 Signal Output Figure 5-49
J1003		Same as J1001.	Upper Sideband V1006 Carrier Input Figure 5-49
R1001		RESISTOR, FIXED COMPOSITION: 1 megohm ±5% ½ W; type no. RC20GF105J, 01121 type.	V1001 Grid Load Figure 5-49
R1002		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	V1001 Parasitic Suppressor Figure 5-49
R1003		RESISTOR, FIXED COMPOSITION: 330 ohms ±5% ½ W; type no. RC20GF331J, 01121 type.	V1001 Cathode Figure 5-49
R1004		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% 1 W; type no. RC32GF472J, 01121 type.	V1001 Screen Supply B+ Dropping Figure 5-49
R1005		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% 1 W; type no. RC32GF473J, 01121 type.	V1002A Cathode Voltage Divider Figure 5-49
R1006		RESISTOR, FIXED COMPOSITION: 8200 ohms ±5% ½W; type no. RC20GF822J, 01121 type.	V1002A Cathode Figure 5-49
R1007		RESISTOR, FIXED COMPOSITION: 33,000 ohms ±5% ½ W; type no. RC20GF333J, 01121 type.	V1005 and V1006 AGC Filter Figure 5-49
R1013		RESISTOR, FIXED COMPOSITION: 100,000 ohms ±5% ½W; type no. RC20GF104J, 01121 type.	USB Meter Multiplier Figure 5-49
R1014		Same as R1001.	V1003 Grid Load Figure 5-49
R1015		Same as R1013.	V1003 Grid AGC Filter Figure 5-49
R1016		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V1003 Grid Parasitic Suppressor Figure 5-49
R1017		RESISTOR, FIXED COMPOSITION: 4.7 megohms ±5% ½ W; type no. RC20GF475J, 01121 type.	V1003 Grid Load Figure 5-49

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R1018		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% ½ W; type RC20GF102J, 01121 type.	V1003 Cathode Figure 5-49
R1019		RESISTOR, FIXED COMPOSITION: 470 ohms ±5% ½ W; type no. RC20GF471J, 01121 type.	V1003 Plate Shunt Load Figure 5-49
R1020		RESISTOR, FIXED COMPOSITION: 3300 ohms ±5% 1 W; type no. RC32GF322J, 01121 type.	V1003 B+ Dropping Figure 5-49
R1021		Same as R1016.	V1004 Grid Parasitic Suppressor Figure 5-49
R1022		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	V1004 Cathode Figure 5-49
R1023		RESISTOR, FIXED COMPOSITION: 390,000 ohms ±5% ½ W; type no. RC20GF394J, 01121 type.	V1004 Cathode Divider Figure 5-49
R1024		RESISTOR, FIXED FILM: 4640 ohms ±1% ½ W; type no. RN70B4641F, 19701 type.	V1004 Plate Load Figure 5-49
R1025		RESISTOR, VARIABLE COMPOSITION: 10,000 ohms ±5% 1 W; type no. RV4LAYSA103C, 71450 type.	V1004 Gain Control Figure 5-49
R1026		RESISTOR, FIXED COMPOSITION: 2200 ohms ±5% 1 W; type no. RC32GF222J, 01121 type.	V1004 Screen B+ Dropping Figure 5-49
R1027		RESISTOR, FIXED COMPOSITION: 12,000 ohms ±5% ½ W; type no. RC20GF123J, 81349 type.	FL1001 Output Load Figure 5-49
R1028		Same as R1001.	V1005 Isolating Figure 5-49
R1029		Same as R1002.	V1005 Parasitic Suppressor Figure 5-49
R1030		RESISTOR, FIXED COMPOSITION: 150 ohms ±5% ½ W; type no. RC20GF151J, 01121 type.	V1005 Cathode Figure 5-49
R1031		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% ½ W; type no. RC20GF103J, 01121 type.	V1005 Shunt Load Figure 5-49
R1032		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% 2 W; type no. RC42GF472J, 01121 type.	V1005 Plate B+ Dropping Figure 5-49
R1033		RESISTOR, FIXED COMPOSITION: 1.5 megohms ±5% ½ W; type no. RC20GF155J, 01121 type.	V1006 Grid AGC Load 1.5 Meg Figure 5-49
R1034		Same as R1002.	V1006 Grid Parasitic Suppressor Figure 5-49
R1035		RESISTOR, FIXED COMPOSITION: 150,000 ohms ±5% ½ W; type no. RC20GF154J, 01121 type.	V1006 Grid Load Figure 5-49
R1036		Same as R1030.	V1006 Cathode Figure 5-49
R1037		Reference Designation Cancelled.	
R1038		Same as R1032.	V1006 B+ Dropping Figure 5-49
R1039		Same as R1005.	V1007 Cathode Volt. Divider Figure 5-49
R1040		RESISTOR, FIXED COMPOSITION: 33,000 ohms ±5% 2 W; type no. RC42GF333J, 01121 type.	V1008 Feedback Figure 5-49
R1041		Same as R1030.	V1007 Cathode Figure 5-49
R1042		RESISTOR, FIXED COMPOSITION: 470,000 ohms ±5% ½ W; type no. RC20GF474J, 01121 type.	V1007 Screen Dropping Figure 5-49
R1043		Same as R1035.	V1007 Plate Load Figure 5-49

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R1044		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% ½ W; type no. RC20GF473J, 01121 type.	V1007 B+ Dropping Figure 5-49
R1045		Same as R1042.	V1008 Grid Load Figure 5-49
R1046		RESISTOR, FIXED COMPOSITION: 270 ohms ±5% 1 W; type no. RC32GF271J, 01121 type.	V1008 Cathode Figure 5-49
R1047		Same as R1019.	T1004 Output Impedance Figure 5-49
T1001		TRANSFORMER, INTERMEDIATE FREQUENCY: resonant frequency 80 kc; shielded; 10 ma dc; type TF4RX15YY, 42498 dwg/part no. B17700.	USB AGC Amplifier Figure 5-49
T1002		Same as T1001.	USB 80 KC IF Figure 5-49
T1003		Same as T1001.	USB 80 KC IF Figure 5-49
T1004		TRANSFORMER, AUDIO FREQUENCY: primary 4100 ohms impedance, secondary #1, 150 ohms impedance; CT, secondary #2, 200 ohms impedance; HS metal case; frequency response 300 cps to 5000 cps ±0.5 db; type TF4RX13YY, 42498 dwg/part no. B18268.	V1008 Audio Output Transformer Figure 5-49
V1001		ELECTRON TUBE: pentode, miniature; type no. 5654/6AK5W, 24446 type.	USB AGC Amplifier Figure 5-49
V1002		ELECTRON TUBE: twin triode, reliable miniature; type no. 5751, 94154 type.	USB Delayed AGC Diode Figure 5-49
V1003		Same as V1001.	USB IF Amplifier Figure 5-49
V1004		Same as V1001.	USB IF Amplifier Figure 5-49
V1005		ELECTRON TUBE: miniature receiving; type no. 5749/6BA6W, 49671 type.	USB IF Amplifier Figure 5-49
V1006		Same as V1005.	USB Demodulator Amplifier Figure 5-49
V1007		Same as V1001.	USB Audio Amplifier Figure 5-49
V1008		ELECTRON TUBE: miniature receiving; type no. 6005/6AQ5W, 24446 type.	USB Audio Output Figure 5-49
XV1001		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V1001 Figure 5-49
XV1002		SOCKET, ELECTRON TUBE: 9, miniature; type no. TS103P01, 91662 type.	V1002 Figure 5-49
XV1003		Same as XV1001.	V1003 Figure 5-49
XV1004		Same as XV1001.	V1004 Figure 5-49
XV1005		Same as XV1001.	V1005 Figure 5-49
XV1006		Same as XV1001.	V1006 Figure 5-49
XV1007		Same as XV1001.	V1007 Figure 5-49

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
XV1008		Same as XV1001.	V1008 Figure 5-49
Z1001		FILTER: 80.3 to 84 kc frequency at 0.5 db attenuation, 80 kc carrier input; 42498 dwg/part no. B29224.	V1006 Demodulator Network Figure 5-49
1101-1199		LSB DETECTOR-AMPLIFIER: c/o 82 kc if. amplifier, bandwidth 3.7 kc, 2 tubes; AGC amplifier 82 kc, 2 tubes, 2 diodes; LSB demodulator, 82 kc, bandwidth 3.7 kc, 1 tube, circuit gain X4 to X5; carrier amplifier, isolates carrier injection for each sideband demodulator, 80 kc, audio amplifier, frequency range 300 to 4000 cps, output 60 mw 600 ohm load, output (phones) 15 mw 600 ohm load, 2 tubes, adjustable threshold, 1 tube; fil 6.3 vac, plate 180 v, 160 vdc; p/o Radio Receiving Set, ASSEMBLY NO. A20400-2.	
C1101		CAPACITOR, FIXED PAPER DIELECTRIC: 100 vdc working .1 uf. ±5%; type no. CZ24BKB104, 81831 type.	Lower Sideband Amplifier Filament Feedthru Figure 5-72
C1102		Same as C1101.	Lower Sideband Amplifier Filament Feedthru Figure 5-72
C1103		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 220 uuf. ±5%; type no. CM15C221J, 72136 type.	V1101 Grid Coupling Figure 5-72
C1104		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 150 uuf. ±5%; type no. CM15C151J, 72136 type.	V1101 Plate Screen Shunt Padder Figure 5-72
C1105		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf ±20%; 56289 dwg/part no. 118P22402T15.	V1101 Cathode by-pass Figure 5-72
C1106		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf ±20%; 56289 dwg/part no. 118P15404T15.	V1101 Screen by-pass Figure 5-72
C1108		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 1000 uuf. ±5%; type no. CM20C102J, 72136 type.	V1102 Input Coupling Figure 5-72
C1109		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.15 uf ±20%; 56289 dwg/part no. 118P15402T15.	V1102A Cathode by-pass Figure 5-72
C1110		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.01 uf ±20%; 00656 dwg/part no. P123ZNP200V103M.	V1106 and V1107 AGC Filter Figure 5-72
C1111		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 1 uf. ±20%; 56289 dwg/part no. 118P10502T15.	V1102B Grid by-pass Figure 5-72
C1112		CAPACITOR, FIXED PAPER DIELECTRIC: 150 vdc working 4 uf. ±20%; 00656 dwg/part no. P16ZN150V402M.	V1106 and V1107 AGC Time Constant Figure 5-72
C1113		Same as C1109.	V1103 Plate by-pass Figure 5-72
C1114		Same as C1106.	V1104A Plate Supply by-pass Figure 5-72
C1115		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.015 uf. ±20%; 00656 dwg/part no. P123ZNP400V153M.	V1104A Plate Coupling Figure 5-72
C1116		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	V1104 Grid Coupling Figure 5-72
C1117		CAPACITOR. FIXED PAPER DIELECTRIC: 200 vdc working 0.33 uf. ±20%; 56289 dwg/part no. 118P33402T15.	V1104 Cathode by-pass Figure 5-72
C1118		Same as C1106.	V1104B Plate Supply by-pass Figure 5-72
C1119		Same as C1115.	V1104B Plate Coupling Figure 5-72

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C1120		Same as C1105.	V1105 Cathode by-pass Figure 5-72
C1121		Reference Designation Cancelled.	
C1122		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.33 uf. ±20%; 00656 dwg/part no. P123ZNP400V333M.	V1105 Plate Coupling Figure 5-72
C1123		Same as C1106.	V1105 Screen by-pass Figure 5-72
C1124		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 15 uuf. ±5%; type no. CM15C150J, 72136 type.	V1105 Plate Shunt Padder Figure 5-72
C1125		CAPACITOR, FIXED PAPER DIELECTRIC: 600 vdc working 0.01 uf. ±5%; type no. CZ24BKF103, 81831 type.	V1105 Screen Feerthru by-pass Figure 5-72
C1126		Same as C1124.	V1106 Grid Shunt Padder Figure 5-72
C1127		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 470 uuf. ±5%; type no. CM15C471J, 72136 type.	V1106 Grid Coupling Figure 5-72
C1128		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.33 uf. ±20%; 56289 dwg/part no. 118P33404T15.	V1106 Screen by-pass Figure 5-72
C1129		Same as C1127.	V1107 Grid Shunt Padder Figure 5-72
C1130		Same as C1103.	V1107 Grid Coupling Figure 5-72
C1131		Same as C1105.	
C1132		Same as C1128.	V1107 Screen by-pass Figure 5-72
C1133		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 100 uuf. ±5%; type no. CM15C101J, 72136 type.	V1109 Feedback Coupling Figure 5-72
C1134		Same as C1125.	V1108 Cathode Feedthru Figure 5-72
C1135		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.047 uf. ±20%; 56289 dwg/part no. 118P47304T15.	V1108 Screen by-pass Figure 5-72
C1136		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.022 uf. ±20%; 56289 dwg/part no. 118P22404T15.	V1108 Screen B+ by-pass Figure 5-72
C1137		Same as C1115.	V1109 Grid Coupling Figure 5-72
C1138		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; type no. CK70A102M, 00656 type.	V1106 Cathode Circuit Figure 5-72
C1139		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.033 uf. ±20%; 00656 dwg/part no. P123ZNP200V333M.	AGC Filter Figure 5-72
C1140		Same as C1115.	V1109 Figure 5-72
C1141		Reference Designation Cancelled.	
CR1101		SEMICONDUCTOR DEVICE, DIODE: germanium; type 1N, JAN type no. 1N198, 71840 type.	V1102B Silencer Control Figure 5-72
CR1102		SEMICONDUCTOR DEVICE, DIODE: silicon; Mil-E-1D type 1N, JAN type no. 1N458, 71840 type.	V1106 and V1107 AGC Figure 5-72
EV1101		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	V1101 Figure 5-72
EV1102		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-5.	V1102 Figure 5-72

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
EV1104		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-4.	V1104 Figure 5-72
EV1105		Same as EV1101.	V1105 Figure 5-72
EV1106		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-2.	V1106 Figure 5-72
EV1107		Same as EV1106.	V1107 Figure 5-72
EV1108		Same as EV1101.	V1108 Figure 5-72
EV1109		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-3.	V1109 Figure 5-72
FL1101		FILTER, BAND PASS: 80.3 to 84 kc bandwidth within 3 db attenuation; 1500 ohms input and output, 42498 dwg/part no. B29187.	V1105 Figure 5-72
J1101		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	Lower Sideband Carrier Output Figure 5-72
J1102		Same as J1101.	Lower Sideband Carrier Input 80 KC — Figure 5-72
J1103		Same as J1101.	Lower Sideband Signal Input Figure 5-72
R1101		RESISTOR, FIXED COMPOSITION: 1 megohm ±5% ½ W; type no. RC20GF105J, 01121 type.	V1101 Grid Load Figure 5-72
R1102		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	V1101 Parasitic Suppressor Figure 5-72
R1103		RESISTOR, FIXED COMPOSITION: 330 ohms ±5% ½ W; type no. RC20GF331J, 01121 type.	V1101 Cathode Figure 5-72
R1104		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% 1 W; type no. RC32GF472J, 01121 type.	V1101 B+ Dropping Figure 5-72
R1105		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% 1 W; type no. RC32GF473J, 01121 type.	V1102A Cathode Voltage Divider Figure 5-72
R1106		RESISTOR, FIXED COMPOSITION: 8200 ohms ±5% ½ W; type no. RC20GF822J, 01121 type.	V1102A Cathode Voltage Divider Figure 5-72
R1107		RESISTOR, FIXED COMPOSITION: 33,000 ohms ±5% ½ W; type no. RC20GF333J, 01121 type.	V1106 and V1107 AGC Filter Figure 5-72
R1113		RESISTOR, FIXED COMPOSITION: 100,000 ohms ±5% ½ W; type no. RC20GF104J, 01121 type.	V1101 Meter Multiplier Figure 5-72
R1114		Same as R1113.	V1104A Plate Filter Figure 5-72
R1115		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% ½ W; type no. RC20GF102J, 01121 type.	V1104A Grid Damping Figure 5-72
R1116		RESISTOR, FIXED COMPOSITION: 2200 ohms ±5% ½ W; type no. RC20GF222J, 01121 type.	V1104A Plate Load Figure 5-72
R1117		Same as R1116.	V1104A Plate B+ Dropping Figure 5-72
R1118		RESISTOR, FIXED COMPOSITION: 470,000 ohms ±5% ½ W; type no. RC20GF474J, 01121 type.	V1104 Grid Load Figure 5-72
R1119		Same as R1116.	V1104B Plate B+ Dropping Figure 5-72

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R1120		Same as R1116.	V1104B Plate Load Figure 5-72
R1121		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V1104 Cathode Bias Figure 5-72
R1122		Same as R1115.	V1104B Grid Damping Figure 5-72
R1123		Same as R1113.	V1104B Plate Filter Figure 5-72
R1124		Same as R1121.	V1105 Parasitic Suppressor Figure 5-72
R1125		Same as R1102.	V1105 Cathode Figure 5-72
R1126		RESISTOR, FIXED COMPOSITION: 390,000 ohms ±5% ½ W; type no. RC20GF394J, 01121 type.	V1105 Cathode Divider Figure 5-72
R1127		RESISTOR, FIXED FILM; 4640 ohms ±1% ½ W; type no. RN70B4641F, 19701 type.	V1105 Plate Load Figure 5-72
R1128		RESISTOR, VARIABLE: 10,000 ohms ±5% 1 W; type no. RV4LAYSA103C, 71450 type.	LSB IF Gain Control Figure 5-72
R1129		RESISTOR, FIXED COMPOSITION: 2200 ohms ±5% 1 W; type no. RC32GF222J, 01121 type.	V1105 B+ Dropping Figure 5-72
R1130		RESISTOR, FIXED COMPOSITION: 12,000 ohms ±5% ½ W; type no. RC20GF123J, 81349 type.	FL 1101 Filter Load Figure 5-72
R1131		Same as R1101.	V1106 AGC Grid Figure 5-72
R1132		Same as R1102.	V1106 Parasitic Suppressor Figure 5-72
R1133		RESISTOR, FIXED COMPOSITION: 150 ohms ±5% ½ W; type no. RC20GF151J, 01121 type.	V1106 Cathode Figure 5-72
R1134		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% ½ W; type no. RC20GF103J, 01121 type.	V1106 Plate Shunt Load Figure 5-72
R1135		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% 2 W; type no. RC42GF472J, 01121 type.	V1106 Plate B+ Dropping Figure 5-72
R1136		RESISTOR, FIXED COMPOSITION: 1.5 megohms ±5% ½ W; type no. RC20GF155J, 01121 type.	V1107 AGC Filter Figure 5-72
R1137		Same as R1102.	V1107 Grid Suppressor Figure 5-72
R1138		RESISTOR, FIXED COMPOSITION: 150,000 ohms ±5% ½ W; type no. RC20GF154J, 01121 type.	V1107 Grid Load Figure 5-72
R1139		Same as R1133.	V1107 Cathode Figure 5-72
R1140		Reference Designation Cancelled.	
R1141		Same as R1135.	V1107 B+ Dropping Figure 5-72
R1142		Same as R1105.	V1108 Cathode Voltage Divider Figure 5-72
R1143		RESISTOR, FIXED COMPOSITION: 33,000 ohms ±5% 2 W; type no. RC42GF333J, 01121 type.	V1109 Feedback Figure 5-72
R1144		Same as R1133.	V1108 Cathode Figure 5-72

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R1145		Same as R1118.	V1108 Screen Dropping Figure 5-72
R1146		Same as R1138.	V1108 Plate Load Figure 5-72
R1147		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% ½ W; type no. RC20GF473J, 01121 type.	V1108 Plate B+ Dropping Figure 5-72
R1148		Same as R1118.	V1109 Grid Load Figure 5-72
R1149		RESISTOR, FIXED COMPOSITION: 270 ohms ±5% 1 W; type no. RC32GF271J, 01121 type.	V1109 Cathode Figure 5-72
R1150		RESISTOR, FIXED COMPOSITION: 470 ohms ±5% ½ W; type no. RC20GF471J, 01121 type.	T1103 Output Transformer Figure 5-72
T1101		TRANSFORMER, INTERMEDIATE FREQUENCY: resonant frequency 80 kc; shielded; 10 ma dc; type TF4RX15YY, 42498 dwg/part no. B17700.	LSB AGC Amplifier Figure 5-72
T1102		Same as T1101.	IF Transformer Figure 5-72
T1103		TRANSFORMER, AUDIO FREQUENCY: primary 4100 ohms impedance, secondary #1, 150 ohms impedance CT, secondary #2, 200 ohms impedance; HS metal case; frequency response 300 cps to 5000 cps ±0.5% db; type TF4RX13YY, 42498 dwg/part no. B18268.	Output Transformer Figure 5-72
V1101		ELECTRON TUBE: pentode, miniature; type no. 5654/6AK5W, 24446 type.	IF AGC Amplifier Figure 5-72
V1102		ELECTRON TUBE: twin triode, reliable miniature; type no. 5751, 94154 type.	A. Delayed AGC Rectifier B. Silencer Relay Amplifier Figure 5-72
V1104		ELECTRON TUBE: twin triode, reliable miniature, receiving; type no. 5670, 49671 type.	Carrier Amplifier Figure 5-72
V1105		Same as V1101.	LSB IF Amplifier Figure 5-72
V1106		ELECTRON TUBE: miniature receiving type no. 5749/6BA6W, 49671 type.	LSB IF Amplifier Figure 5-72
V1107		Same as V1106.	LSB Demodulator Amplifier Figure 5-72
V1108		Same as V1101.	LSB Audio Amplifier Figure 5-72
V1109		ELECTRON TUBE: miniature receiving; type no. 6005/6AQ5W, 24446 type.	LSB Audio Output Figure 5-72
XV1101		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V1101 Figure 5-72
XV1102		SOCKET, ELECTRON TUBE: 9, miniature; type no. TS103P01, 91662 type.	V1102 Figure 5-72
XV1104		Same as XV1102.	V1104 Figure 5-72
XV1105		Same as XV1101.	V1105 Figure 5-72
XV1106		Same as XV1101.	V1106 Figure 5-72
XV1107		Same as XV1101.	V1107 Figure 5-72

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
XV1108		Same as XV1101.	V1108 Figure 5-72
XV1109		Same as XV1101.	V1109 Figure 5-72
Z1101		FILTER: 76 to 79.7 frequency at 0.5 db attenuation, 80 kc carrier input; 42498 dwg/part no. B29224.	Demodulator Network Figure 5-72
1201-1299		POWER SUPPLY: electronic, diode-bridge rectifier, two section LC filter; outputs 180 vdc, 160 vdc, 150 vdc, 6.3 vac 5.6A; power input 105/115/125 vac; p/o Radio Receiving Set AN/WRR-2A, ASSEMBLY NO: A20263.	
C1201		CAPACITOR, FIXED ELECTROLYTIC: 250 vdc working 40-40-40 uf −10 +100%; type no. CE53C400M, 82376 type.	L1201 Power Supply Filter Figure 5-6
C1202		CAPACITOR, FIXED ELECTROLYTIC: 250 vdc working 70-70 uf, —10 +100%; type no. CE52C700M, 82376 type.	Power Supply Filter Figure 5-6
CR1201		SEMICONDUCTOR DEVICE, DIODE: silicon: type 1N, JAN type no. 1N547, 80131 type.	T1201 Bridge Diode Figure 5-6
CR1202		Same as CR1201.	T1201 Bridge Diode Figure 5-6
CR1203		Same as CR1201.	T1201 Bridge Diode Figure 5-6
CR1204		Same as CR1201.	T1201 Bridge Diode Figure 5-6
L1201		REACTOR: 1-2, 1.5 hy, 65 ohms dc resistance 2-3, 5 hy. 120 ohms dc resistance; HS metal closed case; type TF4RX04YY, 42498 dwg/part no. B20027.	T1201 Power Supply Choke Figure 5-6
R1201		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% 2 W; Mil-R-11B type no. RC42GF102J, 01121 type.	L1201 Decoupling Filter Figure 5-7
R1202		RESISTOR, FIXED COMPOSITION: 470 ohms ± 5% 2 W; type no. RC42GF471J, 01121 type.	L1201 Decoupling Filter Figure 5-6
R1203		Same as R1202.	L1201 Decoupling Filter Figure 5-6
R1204		RESISTOR, FIXED WIRE WOUND: 100 ohms ±5% 8 W; type no. RW29G101, 83827 type.	Current Limiting Figure 5-6
T1201		TRANSFORMER, POWER, STEP DOWN AND STEP UP: HS metal case, primary (1-2-3-4) 100/110/120 v, 50/60 cycles, single phase; secondary (5-6) 210 vrms, 190 vdc at 0.2 amp; secondary (7-8-9) 6.3 vrms CT, 5.6 amp; type TF4RX03YY, 42498 dwg/part no. B20001.	Demodulator Power Supply Figure 5-6
XC1201		SOCKET, CAPACITOR: octal mica, w/bushings; type no. TS101P02, 91662 type.	Socket for C1201 Figure 5-6
XC1202		Same as XC1201.	Socket for C1202 Figure 5-6
1301-1399		80 KC FILTER: 80 kc if.; 12 kc bandwidth; insertion loss less than 6 db; input dc 10 ma max; operating range 100 uv to 1.0 v signal (max); p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A29562.	
C1301		CAPACITOR, VARIABLE CERAMIC DIELECTRIC: 500 vdc working 7.0 to 45.0 uuf ±2%; type no. CV11D450, 72982 type.	J1301 Trimmer Figure 5-25
C1302		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf ±20%; 56289 dwg/part no. 118P15404T15.	FL1301 B+ by-pass Figure 5-25
C1303		Same as C1301.	FL1301 Ground Trimmer Figure 5-25

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C1304		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. +80 —20%; type no. CK70A102X, 00656 type.	FL1301 Feedthru by-pass Figure 5-25
FL1301		FILTER, BAND PASS: 76 kc to 84 kc at 6 db attenuation; 42498 dwg/part no. B19423.	J1301 Figure 5-25
J1301		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact straight; 74868 type no. FXR95225.	P1301 Injection Amplifier Figure 5-25
J1302		Same as J1301.	FL1301 80 KC 12 KC BW Figure 5-25
J1303		Same as J1301.	FL1301 80 KC 12 KC BW Figure 5-25
R1301		RESISTOR, FIXED COMPOSITION: 22,000 ohms ±5% ½ W; type no. RC20GF223J, 01121 type.	P1301 Plate Load Figure 5-25
R1302		RESISTOR, FIXED COMPOSITION: 6800 ohms ±5% 1 W; type no. RC32GF682J, 01121 type.	FL1301 B+ Dropping Figure 5-25
1401-1599		Reference Designations Not Used.	
1601-1699		AM DETECTOR-AMPLIFIER: c/o rf selectivity filters, 80 kc, four switch selected bandwidths of 0.35 kc/1.0 kc/3.0 kc/and 12.0 kc, max insertion loss less than 6 db (noise), 1 tube; 80 kc if. amplifier, bandwidth 12 kc, 3 tubes, AGC amplifier 80 kc, 1 tube 2 diodes, 3 switch selected time constants; AM detector/ANL, peak noise limiter, 2 diodes; BFO, var. pitch control, four switch selected operating frequencies, 80 kc, 81 kc, 81.9 kc, 82.55 kc, plate supply has separate voltage regulator, 2 tubes, audio amplifier, frequency range 300 to 4000 cps, output (using USB detector-amplifier common output transformer) 60 mw 600 ohm load, output (phones) 15 mw 600 ohm load, 4 tubes, audio limiter, adjustable threshold control, 2 diodes, symmetrical waveform clipping, cw output level held within 6 db tolerance, instaneous type for A-1 and A-2 signals; audio silencer, panel threshold control, carrier operated, 1 tube, for A-3 signal reception; fil 6.3 vac, plate 180 v, 160 v, 150 vdc; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A20397.	
C1601		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.22 uf. ±20%; 56289 dwg/part no. 118P22402T15.	V1601 Cathode by-pass Figure 5-33
C1602		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.15 uf. ±20%; 56289 dwg/part no. 118P15404T15.	V1601 Screen by-pass Figure 5-33
C1603		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. ±20%; 01121 type CK70A102M.	V1601 Screen Feedthru by-pass Figure 5-33
C1604		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 100 uuf. ±5%; type no. CM15C101J, 72136 type.	T1601 Shunt Figure 5-33
C1605		Same as C604.	V1602 Grid Coupling Figure 5-33
C1606		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 510 uuf. ±5%; type no. CM15C511J, 72136 type.	V1602 AGC by-pass Figure 5-33
C1607		Same as C1601.	V1602 Cathode by-pass Figure 5-33
C1608		Same as C1602.	V1601 Screen by-pass Figure 5-33
C1609		Same as C1606.	V1603 by-pass Figure 5-33
C1610		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 160 uuf. ±5%; type no. CM15C161J, 72136 type.	T1602 Shunt Padder Figure 5-33

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C1611		Same as C1604.	V1603 Grid Coupling Figure 5-33
C1612		Same as C1601.	V1603 Cathode by-pass Figure 5-33
C1613		Same as C1602.	V1603 Screen by-pass Figure 5-33
C1614		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 130 uuf., ±5%; type no. CM15C131J, 72136 type.	T1603 Shunt Padder Figure 5-33
C1615		Same as C1604.	V1604 Grid Coupling Figure 5-33
C1616		Same as C1601.	V1604 Cathode by-pass Figure 5-33
C1617		Same as C1602.	V1604 Screen by-pass Figure 5-33
C1618		CAPACITOR, FIXED MICA DIELECTRIC: 300 vdc working 150 uuf. ±5%; type no. CM15C151J, 72136 type.	T1604 Trimmer Figure 5-33
C1619		Same as C1601.	V1605 Cathode by-pass Figure 5-33
C1620		Same as C1602.	V1605 Screen by-pass
C1621		Same as C1618.	T1605 Shunt Padder Figure 5-33
C1622		Same as C1606.	DSB AGC Filter Figure 5-33
C1623		Same as C1601.	V1608B by-pass Figure 5-33
C1624		Same as C1601.	DSB AGC Filter Figure 5-33
C1625		CAPACITOR, FIXED PAPER DIELECTRIC: 150 vdc working 4 uf. ±20% type no. CH53B1MV405M, 00656 type.	S1605 AGC Filter Figure 5-33
C1627		Same as C1606.	J1610 DSB Coupling Figure 5-33
C1628		Same as C1618.	DSB S1603 RF by-pass Figure 5-33
C1629		Same as C1606.	DSB Detector by-pass Figure 5-33
C1630		CAPACITOR, FIXED PAPER DIELECTRIC: 200 vdc working 0.015 uf. ±20%; 00656 dwg/part no. P123ZNP200V153M.	DSB Detector Coupling Figure 5-33
C1631		Same as C1602.	DSB Detector RF by-pass Figure 5-33
C1632		Same as C1602.	V1606 Screen by-pass Figure 5-33
C1633		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.047 uf. ±20%; 00656 dwg/part no. P123ZNP400V473M.	V1606 Plate Coupling Figure 5-33
C1634		CAPACITOR, FIXED PAPER DIELECTRIC: 400 vdc working 0.033 uf. ±20%; 00656 dwg/part no. P123ZNP400V333M.	V1607 Screen Coupling Figure 5-33
C1635		Same as C1634.	V1608A Plate Coupling Figure 5-33
C1636		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 1000 vdc working 2.6 to 21.5 uuf.; 89819 dwg/part no. ATM-21 locking.	Variable BFO Tuning Figure 5-33

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C1637		CAPACITOR, FIXED MICA DIELECTRIC: 500 vdc working 2700 uuf. ±5%; type no. CM30E272JN3, 72136 type.	V1610 Grid AC Voltage Divider Figure 5-33
C1638		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 100 uuf. ±5%; type no. CC25UJ101J, 91984 type.	L1601 Blocking Figure 5-33
C1639		CAPACITOR, FIXED CERAMIC DIELECTRIC; 500 vdc working uuf. ±5%; type no. CC25UJ680J, 91984 type.	L1601 Blocking Figure 5-33
C1640		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 240 uuf. ±2%; 42498 type no. A14157.	L1601 Blocking Figure 5-33
C1641		Same as C1637.	V1610 AC Voltage Divider Figure 5-33
C1642		Same as C1604.	V1610 Plate Coupling Figure 5-33
C1643		Same as C1602.	V1610 Plate by-pass Figure 5-33
C1644		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 1000 uuf. +80 −20%; type no. CK70A102, 00656 type.	V1610 Feedthru by-pass Figure 5-33
C1650		CAPACITOR, VARIABLE AIR DIELECTRIC: plate meshing type, 9.5 to 105 uuf. 500 vdc working, 80583 type no. RMC-100-S.	BFO Trimmer Figure 5-33
C1653		Same as C1636.	BFO Trimmer Figure 5-33
C1654		CAPACITOR, FIXED CERAMIC DIELECTRIC: 500 vdc working 56 uuf. ±2%; type no. CC32CG560G, 91984 type.	BFO Padder Figure 5-33
C1656		Same as C1644.	V1610 Feedthru by-pass Figure 5-33
C1657		Same as C1644.	V1610 Feedthru by-pass Figure 5-33
C1658		Same as C1602.	V1607 by-pass Figure 5-33
C1659		Same as C1630.	V1608A Grid Coupling Figure 5-33
C1660		Same as C1603.	DSB Amplifier Filament by-pass Figure 5-33
C1661		Same as C1603.	DBS Amplifier Filament by-pass Figure 5-33
C1662		CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 500 vdc working 7.0 to 45.0 uuf. ±2%; type no. CV11D450, 72982 type.	Filter Trimmer Figure 5-33
C1663 thru C1667		Same as C1662.	Filter Trimmers Figure 5-33
C1668		Same as C1606.	V1606 Figure 5-33
C1669		Same as C1606.	V1606 Figure 5-33
C1670		Same as C1606.	V1606 Figure 5-33
CR1601		SEMICONDUCTOR DEVICE, DIODE: silicon; type 1N, JAN type no. 1N458, 80131 type.	DSB AGC Figure 5-33
CR1602		Same as CR1601.	DSB AGC Clamping Figure 5-33

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
CR1603		Same as CR1601.	S1603 Detector Figure 5-33
CR1604		Same as CR1601.	S1603 Noise Limiter Figure 5-33
CR1605		Same as CR1601.	V1607 Plate Limiter Figure 5-33
CR1606		Same as CR1601.	V1607 Plate Limiter Figure 5-33
EV1601		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-1.	V1601 Figure 5-33
EV1602		Same as EV1601.	V1602 Figure 5-33
EV1603		Same as EV1601.	V1603 Figure 5-33
EV1604		Same as EV1601.	V1604 Figure 5-33
EV1605		Same as EV1601.	V1605 Figure 5-33
EV1606		Same as EV1601.	V1606 Figure 5-33
EV1607		Same as EV1601.	V1607 Figure 5-33
EV1608		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-5.	V1608 Figure 5-33
EV1609		SHIELD, ELECTRON TUBE: 96906 type no. MS24233-3.	V1609 Figure 5-33
EV1610		Same as EV1601.	V1610 Figure 5-33
EV1611		Same as EV1609.	V1611 Figure 5-33
FL1601		FILTER, BAND PASS: 79.825 to 80.175 kc bandwidth at 6 db attenuation, 100,000 ohms input, 1 megohm output; 42498 dwg/part no. B29214.	DSB 80 KC IF Band Pass Figure 5-33
FL1602		FILTER, BAND PASS: 79.5 to 80.5 kc bandwidth at 6 db attenuation, 100,000 ohms input, 1 megohm output; 42498 dwg/part no. B29226.	DSB 80 KC IF Band Pass Figure 5-33
FL1603		FILTER, BAND PASS: 78.5 to 81.5 kc bandwidth at 6 db attenuation, 47,000 ohms input, 1 megohm output; 42498 dwg/part no. B29245.	DSB 80 KC IF Band Pass Figure 5-33
J1601		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. male contact, straight; 74868 type no. FXR95225.	Demodulation V1601 Signal Input Figure 5-33
J1602		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; 98291 dwg/part no. SKT-2BC.	V1602 Grid Test Figure 5-33
J1603		Same as J1602.	V1603 Grid Test Figure 5-33
J1604		Same as J1602.	V1604 Grid Test Figure 5-33
J1605		Same as J1602.	DSB V1605 Input Test Figure 5-33

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J1606		Same as J1602.	V1607 Grid Test Figure 5-33
J1607		Same as J1602.	V1608A Grid Test Figure 5-33
J1608		Same as J1602.	V1609 Grid Test Figure 5-33
J1609		Same as J1602.	V1601 Signal Input Figure 5-33
J1610		Same as J1602.	S1603 Input Figure 5-33
K1601		RELAY, ARMATURE: SPDT, 8000 ohms; 1.6 ma operate 0.55 release, HS; 78277 dwg/part no. 22RJC8000GA-SIL.	DSB Silencing FL1604 Figure 5-33
L1601		COIL, RADIO FREQUENCY: 3 pi, universal wound; unshielded; 380 turns per pi; 18 ohms dc resistance, 150 ma; ceramic form, powdered iron core; 42498 dwg/part no. B18998.	BFO Tank Oscillator Figure 5-33
R1601		RESISTOR, FIXED COMPOSITION: 330 ohms ±5% ½ W; type no. RC20GF331J, 01121 type.	V1601 Cathode Bias Figure 5-33
R1602		RESISTOR, VARIABLE COMPOSITION: 10,000 ohms 2 W; type no. RV4LAYSA103A, 71450 type.	V1601 Adjustable Voltage Divider Figure 5-33
R1603		RESISTOR, FIXED COMPOSITION: 180,000 ohms ±5% ½ W; type no. RC20GF184J, 01121 type.	V1601 Cathode Voltage Divider Figure 5-33
R1604		RESISTOR, FIXED COMPOSITION: 4700 ohms ±5% ½ W; type no. RC20GF472J, 01121 type.	V1601 Screen Dropping Figure 5-33
R1605	4	RESISTOR: FIXED COMPOSITION: ±5% ½ W; type no. RC20GF . . . J, 01121 type.	FL1603 Shunt Figure 5-33
R1606	4	RESISTOR: FIXED COMPOSITION: ±5% ½ W; type no. RC20GF . . . J, 01121 type.	FL1601 Shunt Figure 5-33
R1607		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% ½ W; type no. RC20GF473J, 01121 type.	FL1603 Impedance Matching Figure 5-33
R1608	4	RESISTOR: FIXED COMPOSITION: ±5% ½ W; type no. RC20GF . . . J, 01121 type.	FL1602 Impedance Matching Figure 5-33
R1609	4	RESISTOR: FIXED COMPOSITION: ±5% ½ W; type no. RC20GF . . . J, 01121 type.	S1601 Shunt Figure 5-33
R1610		RESISTOR, FIXED COMPOSITION: 100,000 ohms ±5% ½ W; type no. RC20GF104J, 01121 type.	FL1601 Plate Load Figure 5-33
R1611		RESISTOR, FIXED COMPOSITION: 470,000 ohms ±5% ½ W; type no. RC20GF474J, 01121 type.	V1601 Grid Figure 5-33
R1612		Same as R1607.	V1602 Isolating Figure 5-33
R1613		RESISTOR, FIXED COMPOSITION: 470 ohms ±5% ½ W; type no. RC20GF471J, 01121 type.	V1602 Cathode Bias Figure 5-33
R1614		Same as R1604.	V1602 Plate Load Figure 5-33
R1615		Same as R1607.	V1602 Plate and Screen Dropping Figure 5-33
R1616		Same as R1611.	V1603 Grid Figure 5-33
R1617		Same as R1607.	V1603 Isolating Figure 5-33

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R1618		Same as R1613.	V1603 Cathode Bias Figure 5-33
R1619		Same as R1604.	V1603 Plate Load Figure 5-33
R1620		Same as R1607.	V1603 Screen and Plate Dropping Figure 5-33
R1621		RESISTOR, FIXED COMPOSITION: 1 megohm ±5% ½ W; type no. RC20GF105J, 01121 type.	V1604 Grid Figure 5-33
R1622		Same as R1621.	V1604 Grid Load Figure 5-33
R1623		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% ½ W; type no. RC20GF221J, 01121 type.	V1604 Cathode Bias Figure 5-33
R1624		RESISTOR, FIXED COMPOSITION: 27,000 ohms ±5% ½ W; type no. RC20GF273J, 01121 type.	V1604 Plate Load Figure 5-33
R1625		RESISTOR, FIXED COMPOSITION: 5600 ohms ±5% ½ W; type no. RC20GF562J, 01121 type.	V1604 Plate Dropping Figure 5-33
R1626		Same as R1624.	V1605 Isolating Figure 5-33
R1627		Same as R1623.	V1605 Cathode Bias Figure 5-33
R1628		Same as R1607.	V1605 Screen Dropping Figure 5-33
R1629		RESISTOR, FIXED COMPOSITION: 56,000 ohms ±5% ½ W; type no. RC20GF563J, 01121 type.	T1605 Meter Multiplier Figure 5-33
R1630		RESISTOR, FIXED COMPOSITION: 390,000 ohms ±5% ½ W; type no. RC20GF394J, 01121 type.	V1608B Isolating Figure 5-33
R1631		RESISTOR, FIXED COMPOSITION: 220,000 ohms ±5% ½ W; type no. RC20GF224J, 01121 type.	DSB AGC Filter Figure 5-33
R1632		RESISTOR, FIXED COMPOSITION: 120,000 ohms ±5% ½ W; type no. RC20GF124J, 01121 type.	V1605 Plate Voltage Divider Figure 5-33
R1633		RESISTOR, FIXED COMPOSITION: 680,000 ohms ±5% ½ W; type no. RC20GF684J, 01121 type.	DSB AGC Load Figure 5-33
R1634		RESISTOR, FIXED COMPOSITION: 330,000 ohms ±5% ½ W; type no. RC20GF334J, 01121 type.	DSB AGC Load Figure 5-33
R1635		RESISTOR, FIXED COMPOSITION: 39,000 ohms ±5% ½ W; type no. RC20GF393J, 01121 type.	DSB AGC Voltage Divider Figure 5-33
R1636		Same as R1624.	DSB Detector Voltage Divider Figure 5-33
R1637		RESISTOR, FIXED COMPOSITION: 33,000 ohms ±5% ½ W; type no. RC20GF333J, 01121 type.	DBS AGC Voltage Divider Figure 5-33
R1638		Same as R1632.	DSB Detector Series Limiting Figure 5-33
R1639		Same as R1610.	DSB Detector Shunt Figure 5-33
R1640		Same as R1610.	DSB Detector Isolating Figure 5-33
R1641		Same as R1610.	DSB Detector Diode Load Figure 5-33
R1642		Same as R1631.	V1601 Grid Load Figure 5-33

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R1643		Same as R1631.	V1601 Suppressor Grid Load Figure 5-33
R1644		RESISTOR, FIXED COMPOSITION: 1000 ohms ±5% ½ W; type no. RC20GF102J, 01121 type.	V1606 Cathode Bias Figure 5-33
R1645		RESISTOR, FIXED COMPOSITION: 18,000 ohms ±5% ½ W; type no. RC20GF183J, 01121 type.	V1606 Screen Dropping Figure 5-33
R1646		RESISTOR, FIXED COMPOSITION: 10,000 ohms ±5% ½ W; type no. RC20GF103J, 01121 type.	V1606 Plate Load Figure 5-33
R1647		RESISTOR, VARIABLE: 50,000 ohms 1 W; type no. RV4NAYSD-503C, 71450 type.	DSB Audio Gain Figure 5-33
R1648		Same as R1637.	K1601 Relay Shunt Figure 5-33
R1649		RESISTOR, FIXED COMPOSITION: 470 ohms ±5% 1 W; type no. RC32GF471J, 01121 type.	V1607 Cathode Figure 5-33
R1650		RESISTOR, FIXED COMPOSITION: 47,000 ohms ±5% 1 W; type no. RC32GF473J, 01121 type.	V1607 Plate Load Figure 5-33
R1651		RESISTOR, FIXED COMPOSITION: 2.2 megohms ±5% ½ W; type no. RC20GF225J, 01121 type.	V1608 Isolating Figure 5-33
R1652		Same as R1610.	V1608A Cathode Feedback Figure 5-33
R1653		RESISTOR, FIXED COMPOSITION: 1200 ohms ±5% ½ W; type no. RC20GF122J, 01121 type.	V1608 Cathode Bias Figure 5-33
R1654		RESISTOR, FIXED COMPOSITION: 2700 ohms ±5% ½ W; type no. RC20GF272J, 01121 type.	V1608 Cathode Bias Figure 5-33
R1655		Same as R1621.	V1608A Grid Load Figure 5-33
R1656		Same as R1631.	V1608A Plate Load Figure 5-33
R1657		Same as R1611.	V1609 Grid Load Figure 5-33
R1658		RESISTOR, FIXED COMPOSITION: 220 ohms ±5% 1 W; type no. RC32GF221J, 01121 type.	V1609 Cathode Bias Figure 5-33
R1659		Same as R1631.	V1610 Grid Load Figure 5-33
R1660		Same as R1613.	V1610 Grid Suppressor Figure 5-33
R1661		RESISTOR, FIXED COMPOSITION: 100 ohms ±5% ½ W; type no. RC20GF101J, 01121 type.	V1610 Plate Suppressor Figure 5-33
R1662		Same as R1610.	V1610 Plate Load Figure 5-33
R1663		Same as R1646.	V1610 Plate Load Figure 5-33
R1664		RESISTOR, VARIABLE: 100,000 ohms 2 W; type no. RV4-NBYSD104A, 71450 type.	DSB Squelch Control Figure 5-33
R1665		RESISTOR, FIXED COMPOSITION: 22,000 ohms ±5% ½ W; type no. RC20GF223J, 01121 type.	V1610 Voltage Divider Figure 5-33
R1666		RESISTOR, FIXED COMPOSITION: 150,000 ohms ±5% ½ W; type no RC20GF154J, 01121 type.	CR1605 Limiter Input Shunt Figure 5-33
R1667		RESISTOR, FIXED WIRE WOUND: 5600 ohms ±5% 5 W; type no. RW29G562, 83827 type.	V1611 Voltage Dropping Figure 5-33

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R1668		Same as R1611.	DSB Isolating Figure 5-33
R1669		Same as R1610.	DSB Voltage Divider Figure 5-33
R1670		Same as R1610.	CR1606 Voltage Divider Figure 5-33
R1671		RESISTOR, VARIABLE: 50,000 ohms ±2 W; type no. RV4-NBYSD503C, 71450 type.	CR1605 and CR1606 Adjustable Voltage Divider Figure 5-33
R1672		Same as R1646.	V1601 Grid Resistor Figure 5-33
R1673		Same as R1666.	V1609 Voltage Divider Figure 5-33
R1674		Same as R1644.	V1606 Grid Resistor Figure 5-33
R1675		Same as R1607.	V1606 Figure 5-33
R1676		Same as R1607.	V1606 Figure 5-33
S1601		SWITCH, ROTARY: 3 pole, 4 position, shorting; 42498 dwg/part no. B19624-2.	DSB Chassis Figure 5-33
S1602		SWITCH, ROTARY, 3 pole, 4 position, shorting; 42498 dwg/part no. B19624-1.	DSB Chassis Figure 5-33
S1604		SWITCH, ROTARY: 3 pole, 6 position, shorting; 81716 dwg/part no. 222584-A1.	DSB Chassis Figure 5-33
S1605		SWITCH, ROTARY: 1 pole, 4 position, shorting; type no. 81716 dwg/part no. 222585-A1.	DSB Chassis Figure 5-33
T1601		TRANSFORMER, INTERMEDIATE FREQUENCY: resonant frequency 80 kc; shielded; 10 ma; dc, type TF4RX15YY, 42498 dwg/part no. B17700.	V1601 Screen IF Figure 5-33
T1602		Same as T1601.	V1602 Plate Load Figure 5-33
T1603		Same as T1601.	V1603 Plate Load Figure 5-33
T1604		Same as T1601.	V1604 Plate Load Figure 5-33
T1605		Same as T1601.	V1605 Plate Load Figure 5-33
V1601		ELECTRON TUBE: pentode, miniature; type no. 5654/6AK5W, 24446 type.	80 KC IF Amplifier Figure 5-33
V1602		Same as V1601.	80 KC IF Amplifier Figure 5-33
V1603		Same as V1601.	80 KC IF Amplifier Figure 5-33
V1604		Same as V1601.	80 KC IF Amplifier Figure 5-33
V1605		Same as V1601.	AGC Amplifier Figure 5-33
V1606		ELECTRON TUBE: RF pentode, sharp cutoff; type no. 5725/-6AS6W. 94154 type.	DSB Audio Amplifier Figure 5-33

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
V1607		Same as V1601.	DSB Audio Amplifier Figure 5-33
V1608		ELECTRON TUBE: twin triode, reliable miniature; type no. 12AT7WA, 80131 type.	DSB Squelch and AF Figure 5-33
V1609		ELECTRON TUBE: miniature receiving; type no. 6005/6AQ5W, 24446 type.	DSB Audio Output Figure 5-33
V1610		Same as V1601.	BFO Figure 5-33
V1611		ELECTRON TUBE: diode, miniature; type no. OB2WA, 49671 type.	Voltage Regulator Figure 5-33
XV1601		SOCKET, ELECTRON TUBE: 7, miniature; type no. TS102P01, 91662 type.	V1601 Figure 5-33
XV1602		Same as XV1601.	V1602 Figure 5-33
XV1603		Same as XV1601.	V1603 Figure 5-33
XV1604		Same as XV1601.	V1604 Figure 5-33
XV1605		Same as XV1601.	V1605 Figure 5-33
XV1606		Same as XV1601.	V1606 Figure 5-33
XV1607		Same as XV1601.	V1607 Figure 5-33
XV1608		SOCKET, ELECTRON TUBE: 9, miniature; type no. TS103P01, 91662 type.	V1608 Figure 5-33
XV1609		Same as XV1601.	V1609 Figure 5-33
XV1610		Same as XV1601.	V1610 Figure 5-33
XV1611		Same as XV1601.	V1611 Figure 5-33
1801-1899		BLISTER: c/o demodulator unit input/output cable terminations; contains ac power input rf filter, —80 db signal attenuation 1500 kc to 400 mc, rated 105/125 vac 50/60 cps 3A; contains line A and line B low pass audio filters, each filter pass band 80 cps to 5 kc, down 3 db at 8 kc, signal level 12 vrms normal input and output impedance 600 ohms, insertion loss .5 db maximum at 1000 cps; inputs ac power (ships supply), signal if., carrier, controls; outputs ac power, audio line A, audio line B; p/o Radio Receiving Set AN/WRR-2A; ASSEMBLY NO. A20144-2.	
FL1801		FILTER, LOW PASS: cutoff frequency 6 kc; 150 ohm test impedance; type FR4QX11YY, 42498 dwg/part no. B10733.	J651 Demodulator Blister AF 5 KC Figure 5-78
FL1802		Same as FL1801.	J651 Demodulator Blister AF 5 KC Figure 5-78
FL1803		FILTER, RADIO INTERFERENCE: 3 amp 50/60 cycles, 105/125 v; type TF4RX11YY, 42498 dwg/part no. C18952.	J651 Demodulator Blister AC Figure 5-78
J1801		Reference Designation Cancelled.	
J1802		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; type no. AN3102A-10SL-4P, 02660 type.	FL1801 Demodulator Blister AF Output Figure 5-78

TABLE 7-3. RADIO RECEIVING SETS AN/WRR-2A AND AN/FRR-59A, MAINTENANCE PARTS LIST (cont)

REF. DESIG.	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
J1803		Same as J1802.	FL1802 Demodulator Blister AF Output Figure 5-78
J1804		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; type no. AN3102A-14S-7S, 02660 type.	Demodulator Blister Control Figure 5-78
J1805		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; type no. UG-290/U, 71468 type.	Demodulator Blister Signal IF Input Figure 5-78
J1806		Same as J1805.	Demodulator Blister Carrier Input Figure 5-78
J1807		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; type no. AN3102A-16S-5S, 02660 type.	Demodulator Blister AC Power Output Figure 5-78
J1808		CONNECTOR, RECEPTACLE, ELECTRICAL: 1 rd. female contact, straight; type no. AN3102A-16S-5P, 02660 type.	FL1803 Demodulator Blister AC Power Input Figure 5-78
P1801		CONNECTOR, RECEPTACLE, ELECTRICAL: 16 contacts, female, straight; 42498 dwg/part no. B19884.	J651 Figure 5-78
P1802		CONNECTOR, PLUG, ELECTRICAL: 1 rd. female contacts, straight; type no. AN3106A-10SL-4S, 02660 type.	J1802 AF Output Figure 5-78
P1803		Same as P1802.	J1803 AF Output Figure 5-78
P1804		CONNECTOR, PLUG, ELECTRICAL: 3 rd. male contacts, straight; type no. AN3106A-14S-7P, 02660 type.	J1804 Control
P1805		CONNECTOR, PLUG, ELECTRICAL: 1 rd. male contact, straight; type no. UG88 C/U, 91737 type.	J1805 IF Input
P1806		Same as P1805.	J1806 Carrier Input p/o W602
P1807		CONNECTOR, PLUG, ELECTRICAL: 3 rd. male contacts, straight; type no. AN3106A-16S-5P, 02660 type.	J1807 AC Power
P1808		CONNECTOR, PLUG, ELECTRICAL: 3 rd. male contacts, straight; type no. AN3106A-16S-5S, 02660 type.	J1808 AC Power
A1901		MOUNTING MT-2293A/WRR-2, SHOCK MOUNT; shock and vibration mounting cradle; overall dimensions height 25.8″, width 22″, depth 23.3″; c/o four sections, bottom subassembly, rear subassembly, left gusset, right gusset; weight 49.7 pounds; shock and inclination requirements Mil-T-17113; type I vibration requirements Mil-Std-167; p/o Radio Receiving Set AN/WRR-2A, 42498 dwg/part no. B38254-1.	Mounting Cradle Figure 2-4
1922-2799		Reference Designations Not Used.	

INDEX

SUBJECT	PARAGRAPH (*Figure*) **Table*
A	
AF amplifiers:	
V1007 and V1008 (USB)	4-9*e*, (4-30)
V1108 and V1109 (LSB)	4-10*f*, (4-35)
V1606 (AM)	4-8*d*, (4-21)
V1608A and V1609 (AM)	4-8*g*, (4-24)
AGC circuits:	
(AM)	4-8*b*, (4-20)
(LSB)	4-10*c*, (4-28)
(USB)	4-9*c*, (4-28)
Alignment and ganging of capacitors	6-5*b*(13), (6-7)
Amplifier-mixer V806 (synthesizer)	4-16*e*, (4-49)
Amplifier V807 (synthesizer)	4-16*e*, (4-49)
Antenna coupler	4-3, (4-6)
Antijamming procedures	3-4*b*, (3)
Automatic noise limiter CR1604	4-8*c*, (4-21)
B	
Balanced-ring demodulator (USB)	4-9*d*, (4-29)
Balanced-ring demodulator Z1101 (LSB)	4-10*e*, (4-34)
Beat-frequency oscillator	4-8*b*, (4-25)
Blisters	4-19, (4-52)
C	
Carrier amplifier V1104	4-10*d*, (4-33)
Controls:	
Adjustment of	3-2*b*
Description of	3-2*a*
Function of	*3-1
Location of	(3-1)
Nonoperating	3-2*d*
Setting of	3-2*b*, *3-2, *3-3
Converter power supply	4-17, (4-50)
Crystal oscillator	4-11, (4-37)
Crystal oscillator amplifier	4-11*b*, (4-39)
D	
Data (reference)	1-4
Demodulator amplifiers:	
V1006 (USB)	4-9*d*, (4-29)
V1107 (LSB)	4-10*e*, (4-34)
Demodulator power supply	4-18, (4-51)
Detector-amplifier (AM)	4-8, (4-17)
Detector CR1603 (AM)	4-8*c*, (4-21)
Drift-canceling loops:	
General	4-20*a*, (4-53)
High-frequency oscillator	4-20*b*, (4-54)
Interpolation oscillator	4-20*c*, (4-55)
E	
Equipment list	1-5, *1-1, *1-2
F	
Failure report	6-1
Filter, 80 kc	4-7, (4-16)
Frequency divider (function section)	4-15, (4-44)
Frequency dividers V802 and V803 (synthesizer)	4-16*c*, (4-47)
H	
Handling	2-1
Harmonic amplifier and mixer	4-12, (4-41)
Harmonic generator V801	4-16*b*, (4-46)
High-frequency oscillator V301	4-13, (4-42)
I	
IF amplifiers:	
V1003, V1004 and V1005 (USB)	4-9*b*, (4-27)
V1105, V1106 (LSB)	4-10*b*, (4-32)
IF filter, tunable	4-5, (4-9)
Indicator presentations:	
Output-level meters	3-2*c* (2)
Tuning indications	3-2*c* (1)
Injection IF amplifier	4-6, (4-10)
Installation layout	2-3

INDEX

SUBJECT — GRAPH PARA- (*Figure*) **Table*

I—Continued

- Installation requirements:
  - Cabinet assembly and disassembly 2-4*a*
  - Cable connections 2-4*d*
  - Mounting cradle (for AN/WRR-2A) 2-4*b*
  - Securing the cabinets 2-4*c*
- Inspection and adjustments:
  - Initial energizing of equipment 2-5*b*
  - Operation of special circuits 2-5*e*
  - Tuning performance 2-5*c*
  - Reception modes 2-5*d*
- Interpolation oscillator V401 4-14, (4-43)

J

- Jamming, operating in presence of 3-3*b*

L

- LSB detector-amplifier 4-10, (4-32)

M

- Maintenance:
  - Air filter 6-5*d*(4)
  - AM detector-amplifier 6-5*c*(2)
  - Antenna coupling 6-5*b*(1)
  - Converter blister 6-5*b*(12)
  - Converter power supply 6-5*b*(11)
  - Crystal oscillator 6-5*b*(8)
  - Demodulator blister 6-5*c*(6)
  - Demodulator power supply 6-5*c*(5)
  - Emergency 3-4*d*
  - Frequency divider 6-5*b*(9)
  - Harmonic amplifier 6-5*b*(6)
  - HF oscillator 6-5*b*(5)
  - IF filter (80 kc) 6-5*c*(1)
  - Injection IF amplifier 6-5*b*(4)
  - Internal standard adjustment control and int standard log counter 6-5*d*(2)
  - Interpolation oscillator 6-5*b*(7)
  - LSB detector-amplifier 6-5*c*(4)
  - Lubrication 6-5*e*

SUBJECT — PARA-GRAPH (*Figure*) **Table*

M—Continued

- Operating checks and adjustments 3-4*b*
- Preselector 6-5*b*(2)
- Routine check charts 3-4*c*
- Synthesizer 6-5*b*(10)
- Troubleshooting guide *3-5
- Tunable IF filter 6-5*b*(3)
- USB detector-amplifier 6-5*c*(3)
- Ventilating axial fan 6-5*d*(3)

O

- Operation:
  - Amplitude-modulated 3-2*b*(3)
  - Detailed block diagram (4-3)
  - Emergency 3-3
  - Functional 3-1, 4-1, (4-2)
  - Principles of 4
  - Single-sideband 3-2*b*(4)
  - Starting 3-2*b*(1)
  - Summary of 3-3, *3-4
  - System block diagram (4-1)
  - Tuning 3-2*b*(2), 4-1*f*, 4-1*g*
- Operating procedures 3-2
- Oscillator, crystal 4-11, (4-37)
- Output-limiter circuit 4-8*f*, (4-23)
- Oven oscillator-amplifier 4-11*a*, (4-38)

P

- Power distribution 2-2
- Power supply:
  - Converter 4-17, (4-50)
  - Demodulator 4-18, (4-51)
- Preparation for reshipment 2-6
- Preselector 4-4, (4-7), (4-8)
- Pulse shaper V804 4-16*d*, (4-48)

R

- Reference data 1-4
- Repair 6
- Reshipment, preparation for 2-6

INDEX

SUBJECT	PARA-GRAPH (*Figure*) **Table*
S	
Schematic diagrams	6-6
Silencer circuits:	
(AM)	4-8*e*, (4-22)
Synthesizer	4-16, (4-45)
T	
Troubleshooting:	
AM detector-amplifier	5-13
Antenna coupler	5-8
Converter blister	5-22
Converter power supply	5-6
Crystal oscillator	5-18
Demodulator blister	5-23
Demodulator power supply	5-7
Frequency divider	5-19
Harmonic amplifier	5-15
HF oscillator	5-14
IF filter (80 kc)	5-12
Injection IF amplifier	5-11
Interpolation oscillator	5-16
LSB detector-amplifier	5-21
Over-all	5-3
Preliminary control settings	*5-2
Preselector	5-9
Primary power section	5-5
Reference number and subassembly locations	*5-1
Synthesizer	5-20
Test equipment and special tools	5-2
Tunable IF filter	5-10
T—Continued	
Typical troubles	5-24
USB detector-amplifier	5-17
Tuning:	
Basic diagram	(4-5)
Continuous	4-1*g*
Incremental	4-1*f*
Tuning and adjustment:	
BFO	6-4*c*
Converter	6-3
Crystal oscillator adjustment	6-3*a*(6-1)
Crystal oscillator alignment	6-3*a*(6-2)
Frequency divider	6-3*b*
Gain balance adjustments	6-4*d, e, f, g*
Harmonic amplifier	6-3*g*
HF oscillator	6-3*f*
IF filter (80 kc)	6-4*a*
Injection IF amplifier	6-3*e*
Interpolation oscillator	6-3*d*
LSB silencer adjustment	6-4*i*
Preliminary control settings	6-2*e*, *6-2
Prerequisites	6-2*c*
Preselector	6-3*b*
Synthesizer	6-3*c*
Test equipment	*6-1
Tunable IF filter	6-3*i*
USB silencer adjustment	6-4*b*
Variable IF (80 kc)	6-4*b*
U	
Unpacking	2-1
Upper-sideband detector-amplifier	4-9, (4-26)

☆U.S. GOVERNMENT PRINTING OFFICE: 1975-603-823/99